COMPARISON OF THE CORACOID AND RETROCLAVICULAR APPROACHES FOR ULTRASOUND GUIDED INFRACLAVICULAR BRACHIAL PLEXUS BLOCK

DISSERTATION SUBMITTED FOR

DOCTOR OF MEDICINE

BRANCH X (ANAESTHESIOLOGY)

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THE TAMIL NADU DR.M.G.R MEDICAL UNIVERSITY

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DECLARATION

I, **Dr.S.DHILIPAN** solemnly declare that, this dissertation titled **"Comparison of the coracoid and retroclavicular approaches for ultrasound guided infraclavicular brachial plexus block"** has been done by me. I also declare that this bonafide work or a part of this work was not submitted by me or any other for any award, degree or diploma to any other University or board either in India or abroad.

This is submitted to The Tamilnadu DR.M.G.R Medical University, Chennai in partial fulfillment of the rules and regulations for the award of Doctor of Medicine degree branch X (Anaesthesiology) to be held in APRIL 2019.

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INTRODUCTION

Ultrasound guided peripheral nerve block:

In the last decade, image guided peripheral nerve blocks have become the norm for anaesthesiologist at the forefront of regional anaesthesia. Ultrasonographic imaging devices are non-invasive and portable and used for direct visualization of peripheral nerves and also used for viewing the needle tip, and local anaesthetic distribution. Most of the peripheral nerve block work has been done using scanning probes with high frequencies 12-15 Mhz.

INFRACLAVICULAR BRACHIAL PLEXUS BLOCK

Described by BRAZY in 1914 and modified by RAJ in 1973. Posterior approach of infraclavicular plexus block was first described by HEBBARD and ROYCE. There are several approaches to this block which depends on surface landmark, needle insertion and needle direction.Most common approaches are CORACOID, LATERAL SAGGITAL and VERTICAL approach.Amongst all these approaches CORACOID is most commonly used.

Anaesthetic technique

Ultrasound guided infraclavicular brachial plexus block was performed with

1) depth setting of 3 to 7 cm

2) transducer high frequency linear transducer

Now the transducer is placed inferior to lateral end of the clavicle. Axillary artery and axillary vein appear in short axis as hypo-echoic structures posterior to pectoralis major and pectoralis minor muscle.

Three cords of brachial plexus are identified around the axillary artery as hyper echoic circles or oval with hypo echoic fascicle in the centre. The needle is advanced posterior to axillary artery in the IN-PLANE technique where the posterior cord of brachial plexus is present.Single injection is given to generate circumferential spread of local anaesthetic around the axillary artery.

AIM OF THE STUDY

To Compare the coracoid and retro clavicular approaches for ultrasound guided infraclavicular brachial plexus block

BASICS OF ULTRASOUND

Ultrasound application allows for non-invasive visualization of the tissue structures.

HISTORY OF ULTRASOUND

1880: Pierre and Jacques Curie discovered about the piezoelectric effect in crystals.

1942: Karl and Dussik described ultrasound used as diagnostic tool.

1978: P. La Grange published ultrasound application for placement of needles for nerve blocks.

1989: P. Ting and V. Sivagnanaratnam used USG to demonstrate the anatomy of the axilla and observe the spread of local anaesthetics during axillary block.

1994: Steven Kapral and colleagues explored brachial plexus blockade using B-mode ultrasound.

DEFINITION: Ultrasound is a form of acoustic energy which is defined as the longitudinal progression of pressure changes. Ultrasound frequencies commonly used for medical diagnosis are between 2 MHz and 15 Mhz. These pressure changes consist of areas of compression and relaxation of particles in a given medium. The piezoelectric effect is a phenomenon exhibited by the generation of an electric charge in response to a mechanical force(squeeze or stretch) which is applied on certain material. Lead zirconate and titanite have been used as piezoelectric material. However, by stacking the piezoelectric element into layer in a transducer, the transducer can convert the electrical energy into mechanical oscillation. These mechanical oscillations are converted to electrical energy.

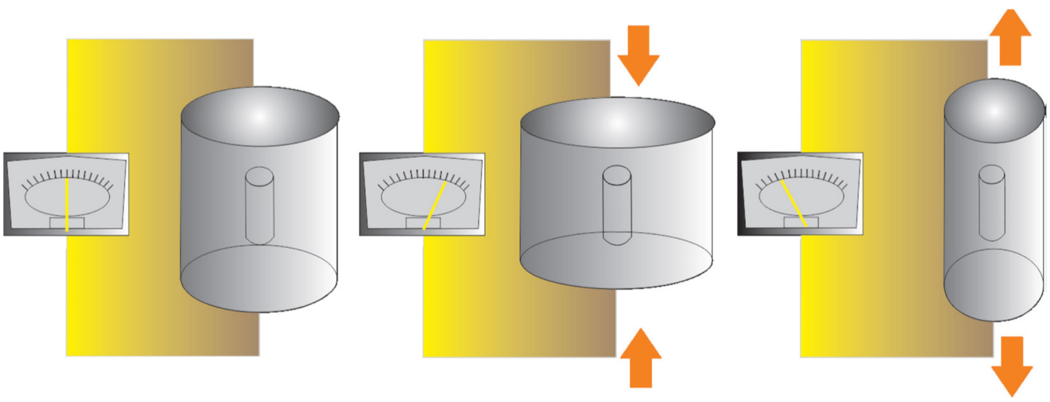


Figure 1 – Piezoelectric effect

For simplicity, an ultrasound wave is often modelled as a sine wave. Each ultrasound wave is defined by a specific wavelength (λ) measured in units of distance, amplitude (h) measured in decibels (dB), and frequency (f) measured in hertz (Hz) or cycles per second. Ultrasound has frequency of more than 2khz.

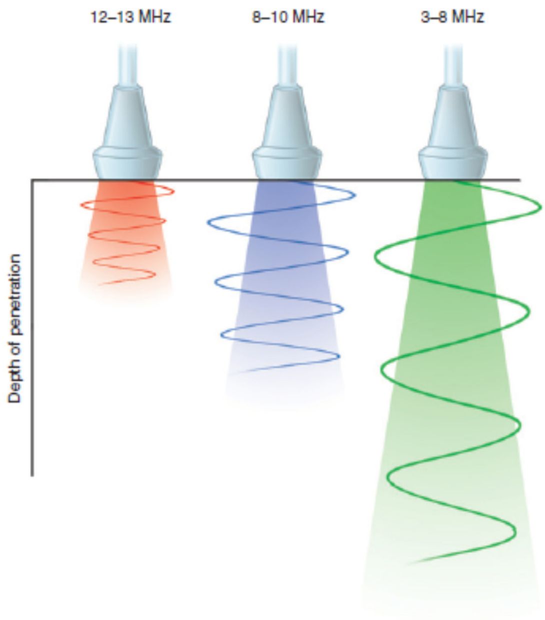


Figure 2 – Different probes with their penetrations

Probe frequency must be decided according to the depth of tissue penetration.Higher-frequency ultrasound waves are used for more superficial structures, although it provides more image detail which is described as tissue resolution. The transducer, after emitting the wave, switches to a receiver mode from transmitter mode. When ultrasound waves return to the transducer, the piezoelectric crystals will vibrate. At this time the sound energy is converted to electrical energy. This process of transmission and reception can be repeated over 7000 times per second and this, when coupled with computer processing, results in the generation of a real-time, two-dimensional image that appears seamless. By convention, whiter (hyperechoic) objects represent more reflection and higher signal intensities, whereas darker(hypoechoic) images represent less reflection and weaker signals.

ULTRASOUND TERMINOLOGIES

1) Wavelength : It is the length of space over which one cycle occurs, it is equal to the travel distance from the beginning to the end of one cycle.
2) Acoustic Velocity : It is the speed at which sound wave travels through a medium. Its determinants are stiffness and density of the medium. It is directly proportional to stiffness and inversely proportional to density.
3) Acoustic Impedance: It is the degree of difficulty by which a sound wave can be transmitted through a medium. It is a multiplication of density and acoustic velocity.
4) Attenuation Coefficient : It increases with increasing frequency of the ultrasound.

5) Self-focusing effect of Ultrasound: Natural narrowing of the ultrasound beam at a certain travel distance in the ultrasonic field. This effect amplifies ultrasound signals by increasing acoustic pressure.

Resolutions:

AXIAL: minimum separation of above-below planes along the beam axis.

LATERAL: side by side distance between two objects

TEMPORAL: to observe the moving objects

Interaction of Ultrasound waves with tissues

REFLECTION: Reflection of a sound wave islike optical reflection. Here energy is sent back into the originating medium. True reflection means, reflection angle θr must equal incidence angle θi. The strength of the reflection depends on the difference of impedances between two media and the incident angle. If the impedances are equal, there is no reflection. If there is a significant difference between the media impedances, there will be far greater or nearly complete reflection. This reflection intensity is highly angle dependent, which means that the ultrasound transducer must be placed perpendicularly to the target nerve to visualize it clearly.

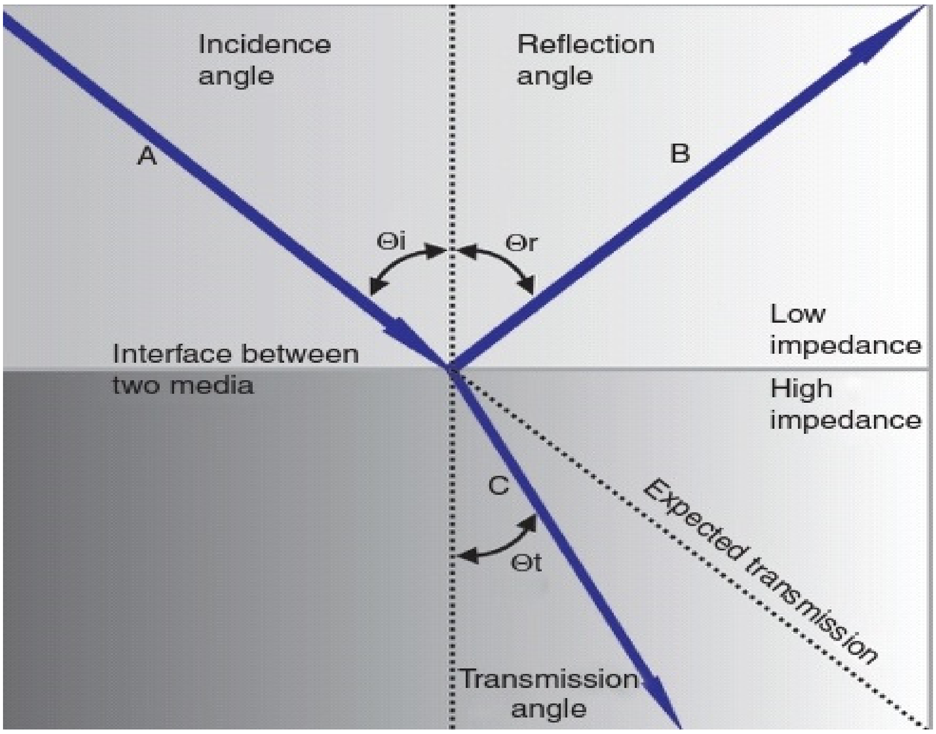


Figure 3 – Interaction of ultrasound wave through a medium

SCATTERING: It is the redirection of sound in any direction through rough surfaces or heterogeneous media. Reflection intensities is relatively independent of the direction of the incident sound wave. Therefore, the visualization of the target nerve is not significantly influenced by scattering.

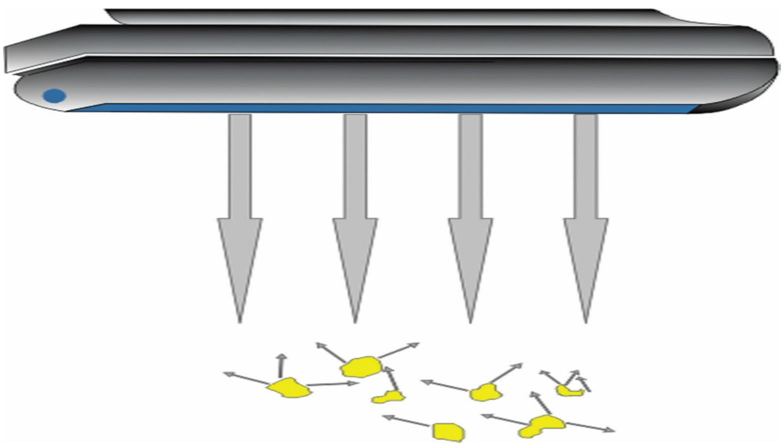


Figure 4 - Scattering

ABSORPTION: Absorption is defined as the direct conversion of sound energy into heat energy.Ultrasound scanning generates heat in the tissue. Higher scanning frequency gives better axial resolution and visualization of superficial structures. Lower frequency is selected to increase the penetration for visualization of deeper structures. Use of longer wavelengths produce lower resolution and hence the resolution of ultrasound imaging is proportional to wavelength of the imaging wave. The frequencies between 6 and 12 MHz is used for imaging of the peripheral nerves. Lower frequencies between 2 and 5 MHz, are used for imaging of neuraxial structures.

ULTRASOUND IMAGING MODES

A-MODE: Oldest modality and currently not used for regional anaesthesia. The transducer sends a single pulse of ultrasound into the medium and waits for the returned signal. Consequently, a simple one-dimensional ultrasound image is generated as a series of vertical peaks corresponding to the depth of the structures at which the ultrasound beam encounters different tissues. The distance between the echoed spikes can be calculated by dividing the speed of the ultrasound in the tissue (1540 m/sec) by half the elapsed time.

B-MODE: It is the **current mode used in regional anaesthesia**.

It supplies a two-dimensional image of the area by simultaneously scanning from a linear array of 100–300 piezoelectric elements rather than one. The amplitude of the echo from a series of A-scans is converted into dots of different brightness in B-mode imaging. The horizontal and vertical directions represent real distances in tissue, whereas the intensity of the gray scale indicates echo strength.

M-MODE: Used to produce a picture with a motion signal,Extensively used in cardiac and fetal cardiac imaging.

ULTRASOUND INSTRUMENTS:

Ultrasound machines convert the echoes received by the transducer into visible dots, which forms ananatomic image on ultrasound screen. The brightness of each dot corresponds to echo strength producing a gray scale image. Two types of scan transducers are used in regional anaesthesia: linear and curved.

A linear transducer produces parallel scan lines and rectangular display, called a linear scan, whereas a curved transducer produces a curvilinear scan and arc-shaped image. An aqueous gel is applied to eliminate the air layers. The ultrasound machines used in regional anaesthesia gives a two-dimensional image, or “slice.” The 3D-real time imaging systems lacks the resolution and simplicity of 2D images, so their practical use in regional anaesthesia is limited.

LINEAR TRANSDUCER	CURVILINEAR TRANSDUCER
Rectangular in shape	Curvilinear in shape
Beam is rectangular and near field resolution	Convex beam and in-depth examination
7-16 MHz	2-7 MHz

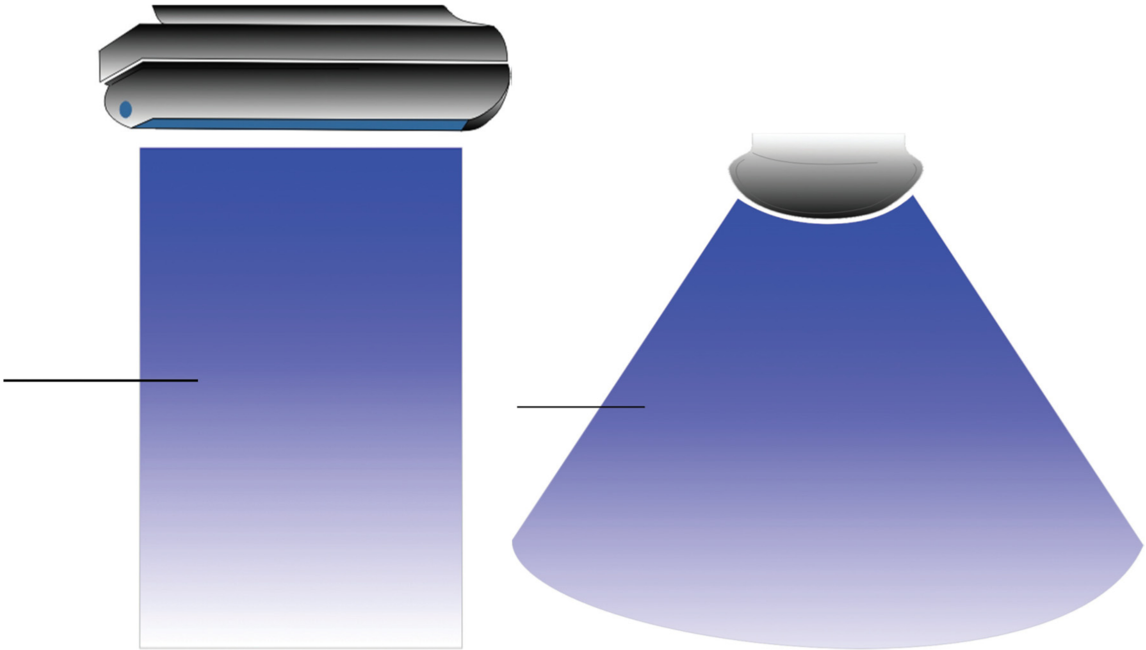


Figure 5 – Linear Transducer and Curvilinear Transducer

HOW TO IMPROVE ULTRASOUND IMAGE:

Improving the quality of image produced by ultrasound is an essential skill for performing an ultrasound-guided nerve block. The echo texture of normal peripheral nerves are hyperechoic, hypoechoic, or honeycomb pattern. Many scanning steps and techniques may be used to facilitate adequate nerve imaging, including the selection of sonographic modes, adjustment of function keys, needle visualization and interpretation of image artefacts. There are three sonographic imaging modes in ultrasound guided regional anaesthesia:

1)**Conventional imaging** generated by a single-element angle beam.

2)**Compound imaging** is produced by acquiring several overlapping frames from different frequencies or angles.

3)**Tissue harmonic imaging** produced from harmonic frequencies generated by ultrasound beam transmission through the tissue that improves tissue contrast.

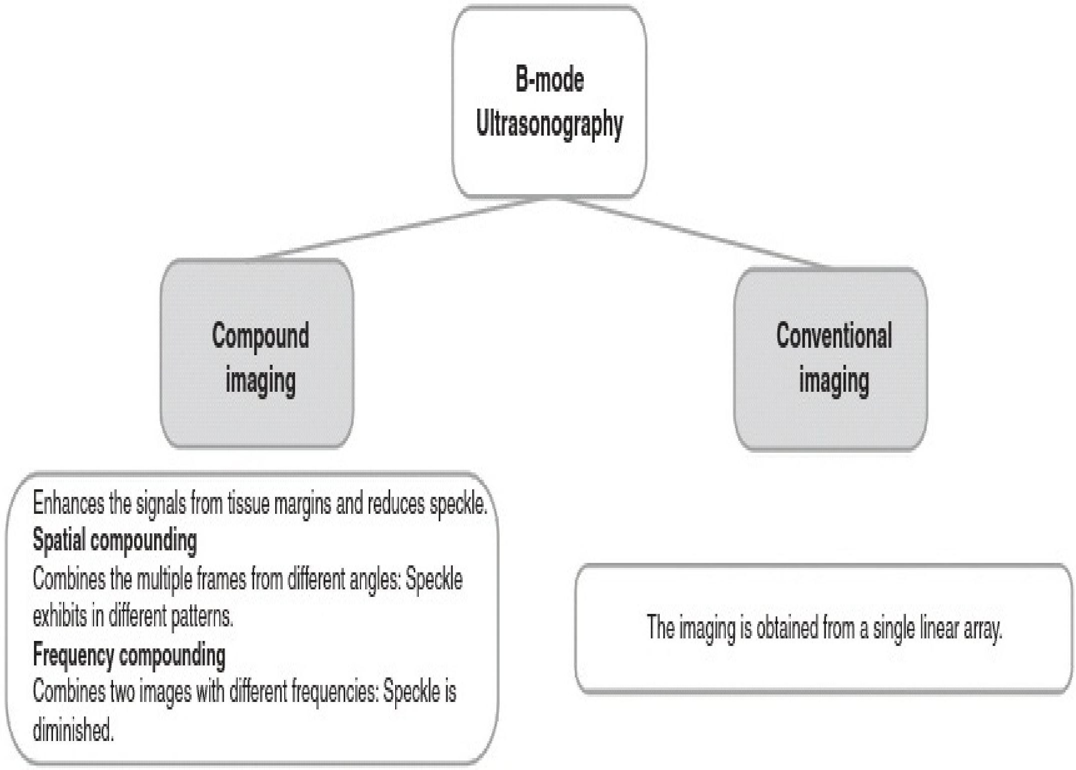


Figure 6 – Sonographic Imaging mode

Five functional keys on ultrasound machine:

1. **Depth**: The depth of the nerve is the most important consideration in ultrasound-guided peripheral nerve block. The target nerve should be at the centre the ultrasound monitors to get the best resolution of the nerve and reveal its relevant anatomical structures.Example infraclavicular brachial plexus blockade requires 4 to 7 cm of depth.

FIELD DEPTH in cm	FREQUENCY in MHz	PERIPHERAL BLOCKADE
<2	12-15	Wrist and Ankle block
2-3	10-12	Interscalene and axillary
3-4	10-12	Femoral and Supraclavicular
4-7	5-10	Infraclavicular and Popliteal
7-10	5-10	Pudental and gluteal sciatic
>10	3-5	Anterior approach of Sciatic

.

2. **Frequency** : Optimal frequency of ultrasound transducer should be selected to visualize the target nerves clearly. The higher the frequency of ultrasound, more rapid absorption, and less distance propagation is seen.

3. **Focusing**: Lateral resolution is improved by selecting the higher frequency and focusing the ultrasound beam. In our practice the focus is at the level of the target nerve

4. **Gain**: Brightness of screen depends on two function buttons: gain and time-gain compensation(TGC). Optimal gain is the gain at which the best contrast is obtained between the muscles and the adjacent connective tissue.

5. **Doppler**: In regional anaesthesia most of the nerves situated adjacent to the vascular structures. So it is used to locate the nerve and local anaesthetic spread. Doppler velocity is set between 10 and 20 cm/s.

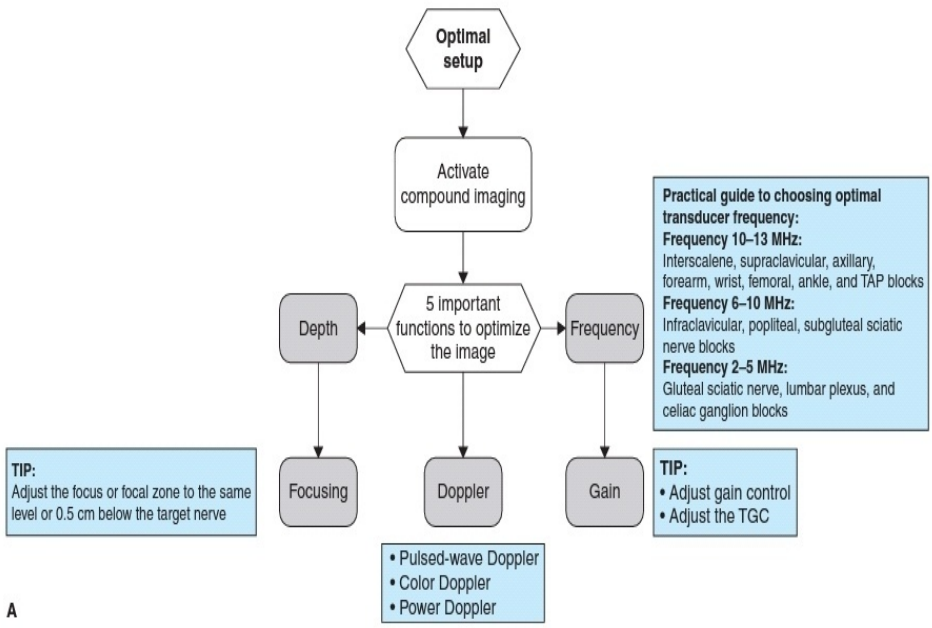


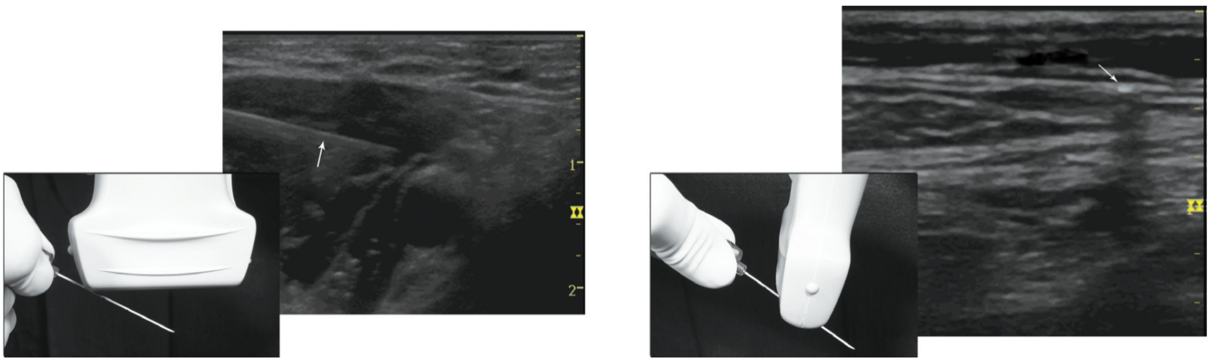
Figure 7 – Optimising Ultrasound Image

NEEDLE INSERTION TECHNIQUES:

Two types are:

1) **INPLANE TECHNIQUE**
2) **OUT OF PLANE TECHNIQUE**

In In-plane technique needle is placed parallel to the plane of ultrasound beam; so,the needle shaft and the tip can be visualised clearly and advanced toward the target nerve. Tilting or rotating the transducer can improve its better visualization.



IN PLANE OUT OF PLANE

Figure 8

In out-of-plane technique needle is perpendicular to ultrasound beam of the transducer. The needle shaft is imaged in a cross-sectional plane and can be identified as a bright dot in the above image.

NEEDLE TIP VISIBILITY

Many factor influence the needle visibility in practice. Metal needles are hyper echoic. The needle tip and shaft visibility is best seen when the needle path is parallel to the transducer probe thereby the needle is perpendicular to ultrasound beam which make a strong image which makes a mirror like reflection.

Factors influencing needle tip visibility:

As the angulation of needle increases the brightness of needle will be decreased Bevel orientation improves the tip visibility when the bevel is facing towards the transducer probe.

Large needles are more echogenic than finer ones.Low receiver gain improves the needle tip visibility.Spatial compound imaging improves the needle tip even if the needle path is angulated. Rocking back the transducer can improve the angle between beam and the needle. Hustead bevels tends to be more visible.

When the texture of needle surface is modified, echoes which return to the transducer beam increases despite angle of insonation

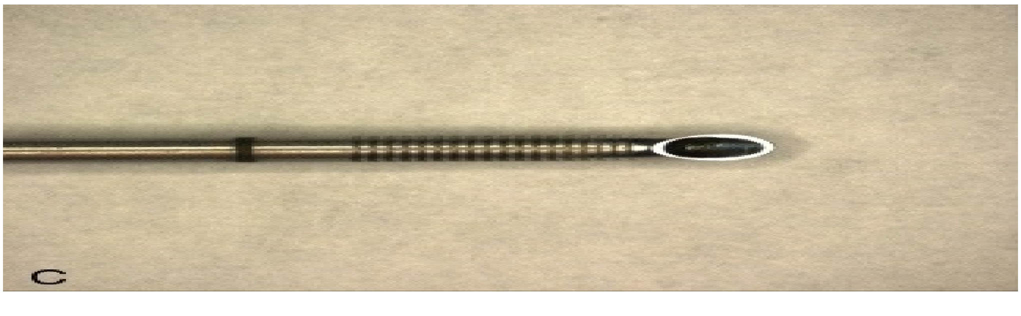


Figure 9 – Echogenic Needle

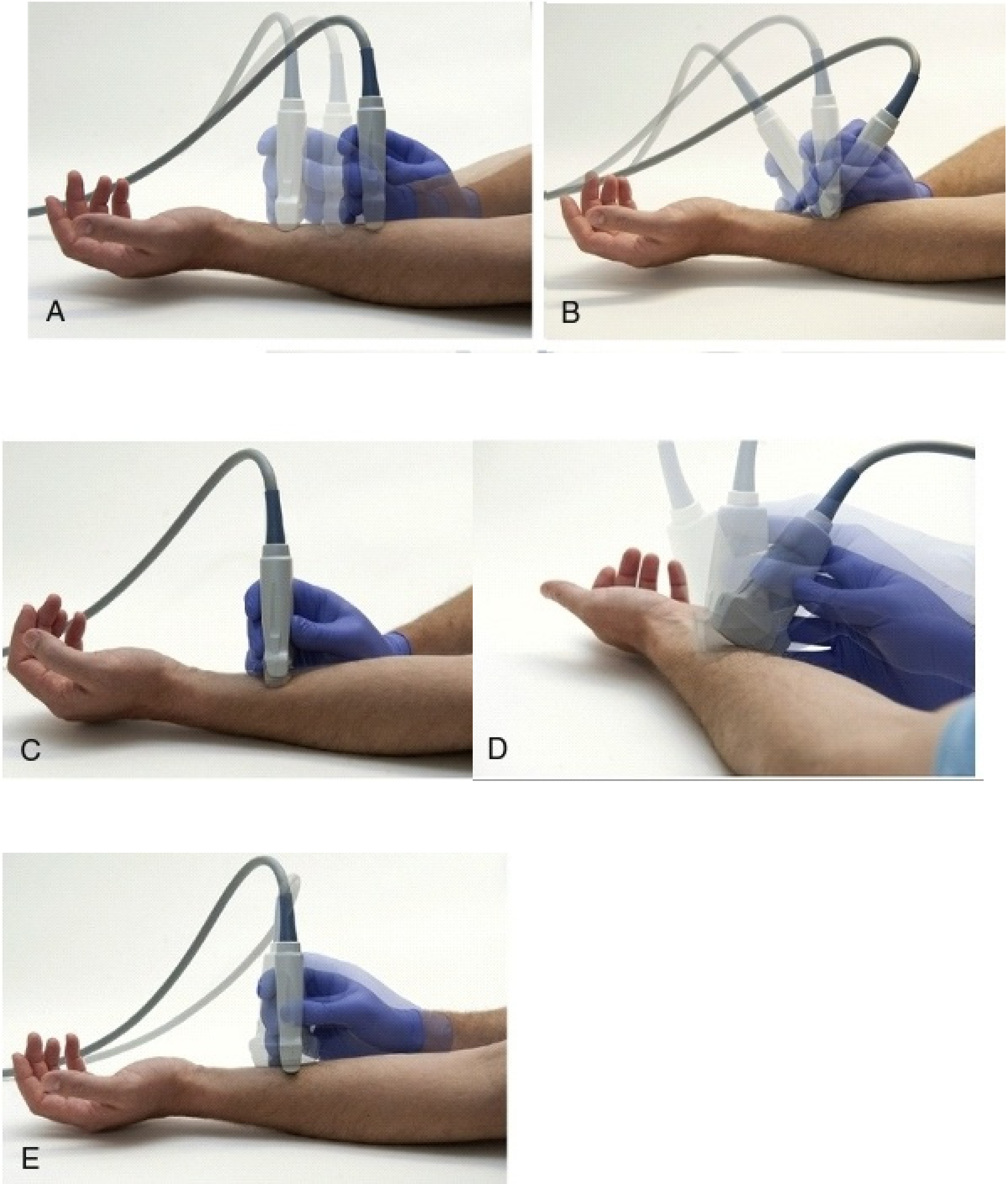


Figure 10 – Transducer manipulation

a. Sliding b. Tilting c. Compression d. Rocking e. Rotation

ARTEFACTS IN ULTRASOUND

1.**Acoustic Shadowing** is reduction of ultrasound energy lying behind the solid objects. This is seen as abnormal decrease of the brightness behind the solid object.

2**.Acoustic Enhancement** manifests as increase in echogenicity behind an object. Scanning from different angles or planes decreases the shadowing/enhancement.

3.**Reverberation** is equally spaced bright linear beam behind the reflectors mostly seen in superficial nerve blocks. It may be decreased by changing the scanning direction and its frequency.

4.**Mirror image artefact** Here the object located on one side of a highly reflective interface, appears on other side as well. It is attenuated by changing the direction.

5.**Velocity error** is the interface of displacement due to difference in actual velocity of ultrasound compared to the human soft tissue, compared with the calibrated speed, whichis assumed to be 1540 m/sec in the ultrasound system.

ANATOMY OF BRACHIAL PLEXUS

The brachial plexus provides the motor and sensory supply of the upper limb. Formation of the plexus:

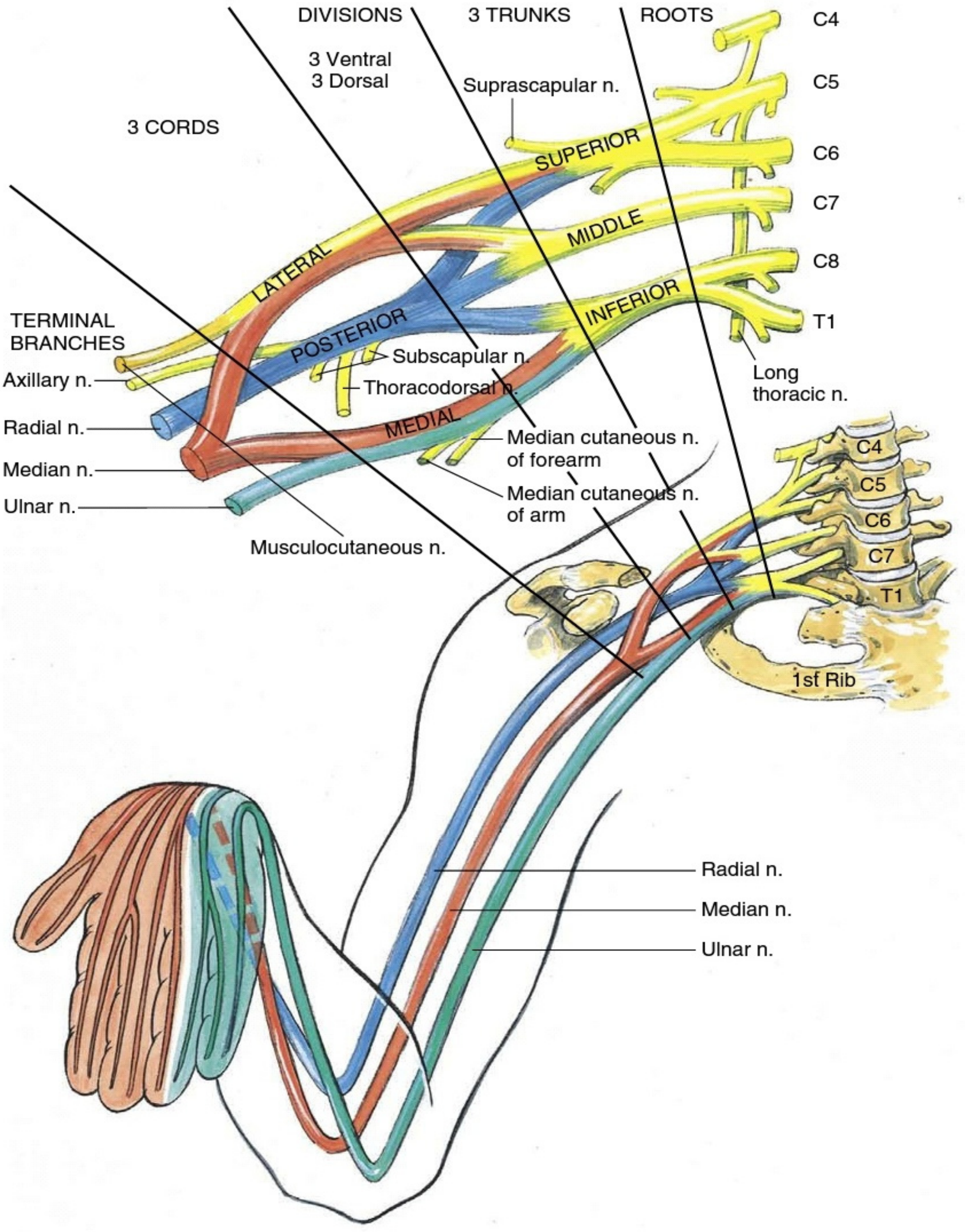


Figure 11 – Brachial plexus anatomy

The plexus is formed by the anterior rami of C5–8, T1. It also has a Contribution, above from C4 and below till T2. The plexus is mainly formed from C4–C8 it is a pre-fixed plexus or from C6–T2 it is post-fixed plexus.

All five roots go between scalenus anterior and medius. Then the roots of C5 and C6 unite to form the superior trunk, C7 continues as the middle trunk and those of C8 and T1 unite to form inferior trunk. The sheath around the brachial plexus is formed from the anterior and posterior tubercles of the transverse processes of the cervical vertebrae.

This sheath extends from the root to the cord of the brachial plexus. The plexus passes between the scalene muscles to the 1st rib, here a variety of nerve blocks can be given which are supraclavicular, intersternocleidomastoid and subclavian perivascular techniques. At the lateral border of first rib, each trunk divides into Anterior and Posterior divisions. On entering the axilla all the 3 posterior division form the posterior cord, upper two anterior division forms the lateral cord and lower anterior division form the medial cord. All these cords are named in relation to the second part of axillary artery.

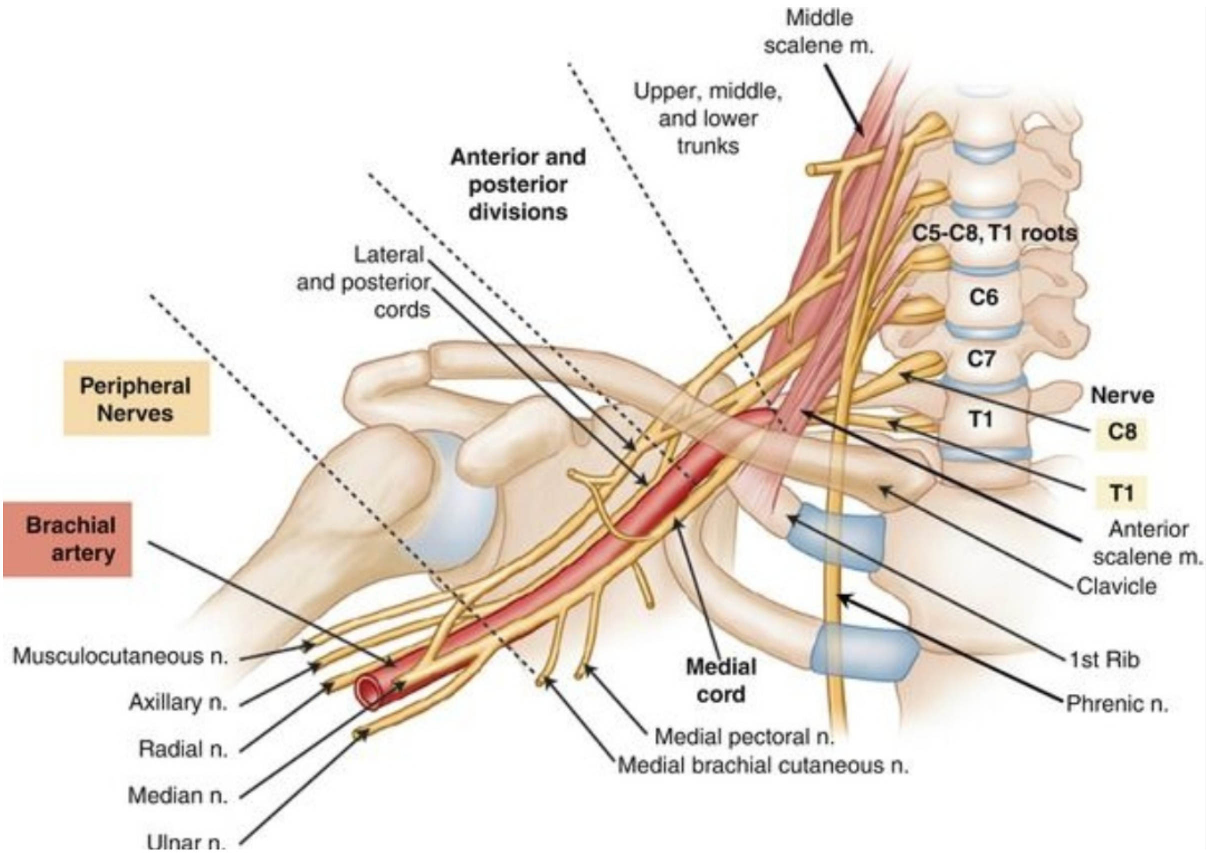


Figure 12 - Relation of brachial plexus with axillary artery

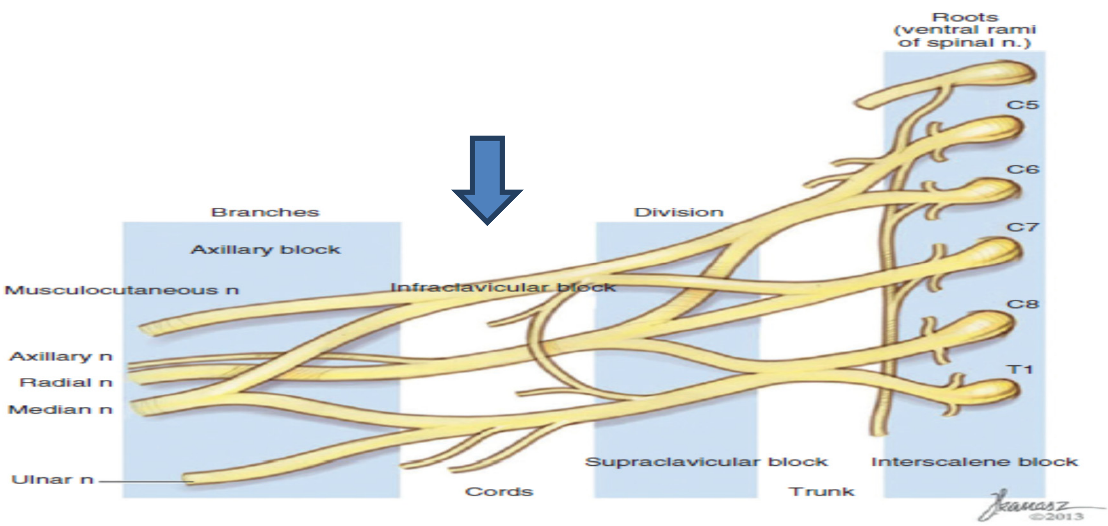


Figure 13 – Parts of brachial plexus and its blockade

Composition of brachial plexus

5 roots C5-C8,T1

3 trunks

a. Upper C5,C6
b. Middle C7
c. Lower C8,T1

6 divisions

3 cords

a. Lateral C5-C7
b. Medial C8-T1
c. Posterior C5-T1

In relation to clavicle, the branches divide from plexus into

a. Supraclavicular branches ofbrachial plexus
b. Infraclavicular branches of brachial plexus

Branches of Supraclavicular brachial plexus

a. nerve to the rhomboids (C5)
b. nerve to serratus anterior (C5–7)
c. suprascapular nerve (C5, C6)
d. nerve to subclavius (C5, C6)

Hereafter we describe the relation and branches of infraclavicular brachial plexus in detail .

RELATION OF INFRACLAVICULAR BRACHIAL PLEXUS

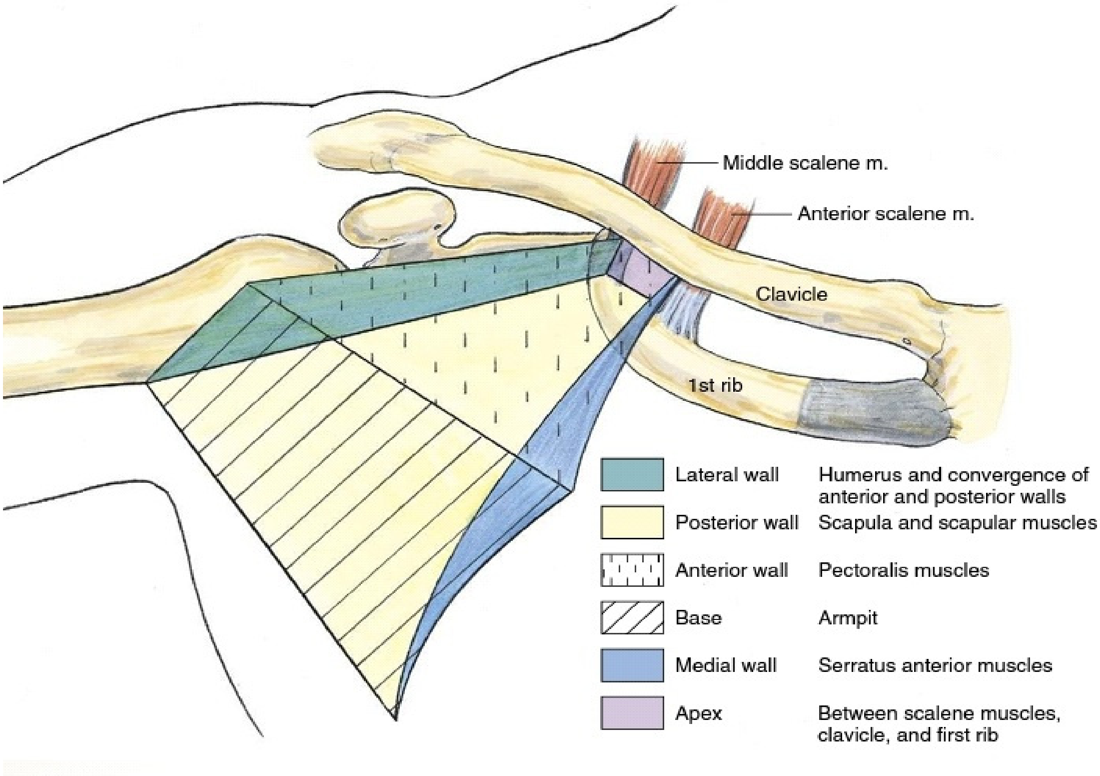


Figure 14 – Relations of infraclavicular brachial plexus

Infraclavicular brachial plexus is nothing but the cords of the brachial plexus.

Anatomy: At proximal axilla, where the infraclavicularblock is performed, the axilla is a pyramid shaped space with,

1. apex formed by scalene muscle, clavicle and rib
2. base formed by arm pit, and four sides
3. anterior wall by pectoralis muscles
4. posterior wall by scapula
5. medial wall by serratus anterior muscle
6. lateral wall by the humerus

Once the cord enters the apex of the axilla, it groups around the axillary artery. At first medial cord lies behind the artery, the posterior and lateral cords lie lateral to the axillary artery. These cords get their specific names with relation to the second part of the axillary artery.

INFRACLAVICULAR BRANCHES

Branches of lateral cord :

a. Lateral pectoral nerve,C5-C7
b. Musculocutaneous nerve, C5-C7 which continues further as
c. lateral cutaneous nerve of forearm

Branches of medial cord :

a. Medial pectoral nerve C8,T1
b. Medial cutaneous nerve of the arm
c. Medial cutaneous nerve of the forearm

The medial cord continues further as the Ulnar nerve.

Branches of posterior cord :

a. Upper and lower subscapular nerves C5,C6
b. Thoracodorsal nerve C6-C8
c. Axillary nerve C5,C6

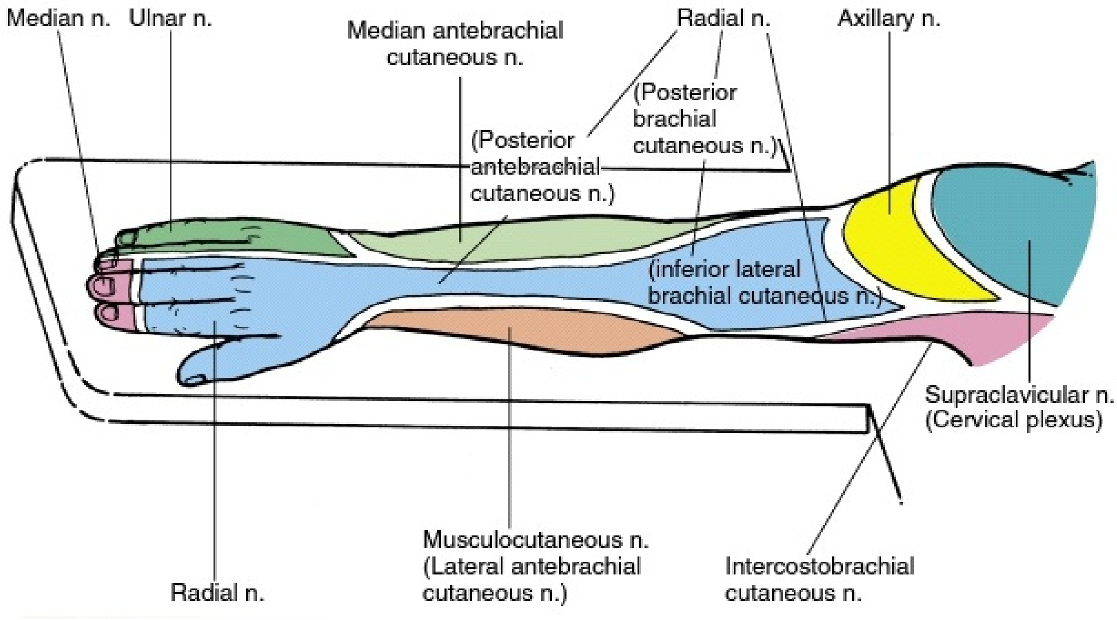


Figure 15 – Peripheral nerve innervation of pronated arm

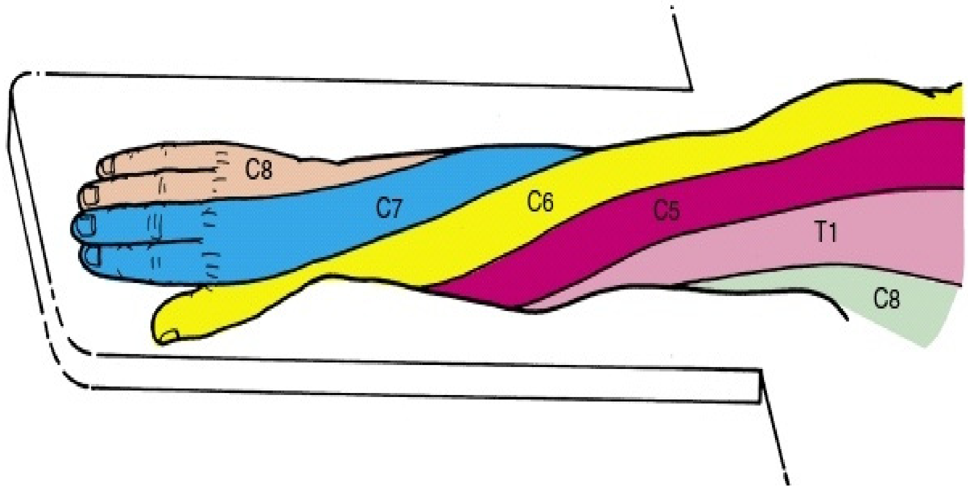


Figure 16 – Dermatomal innervation of pronated arm

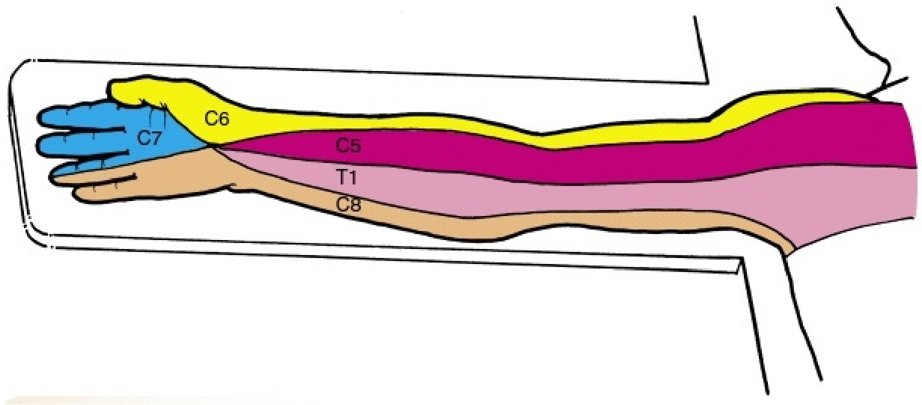


Figure 17 – Dermatomal innervation of supinated arm

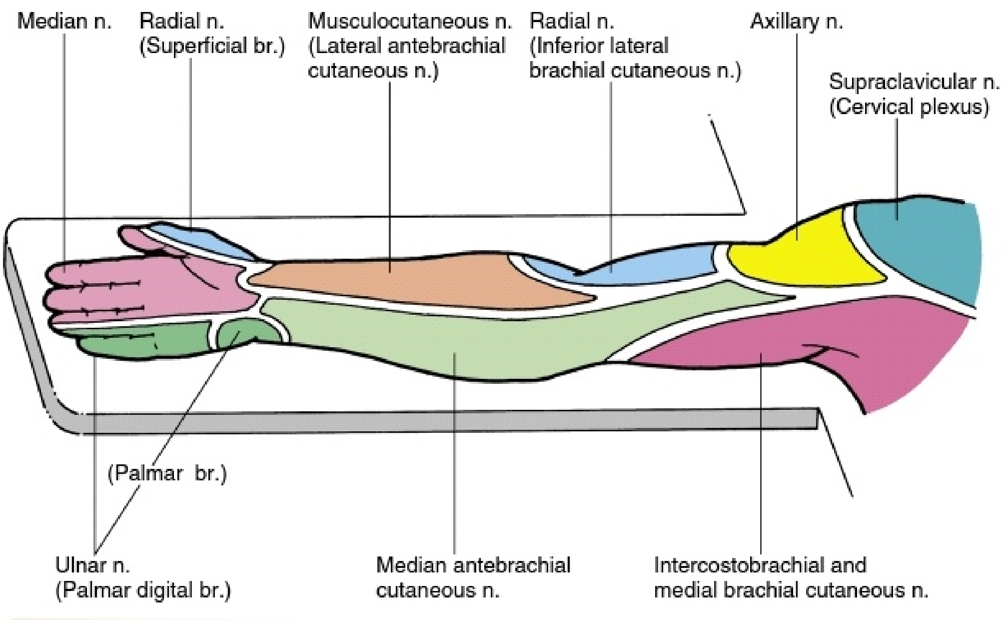
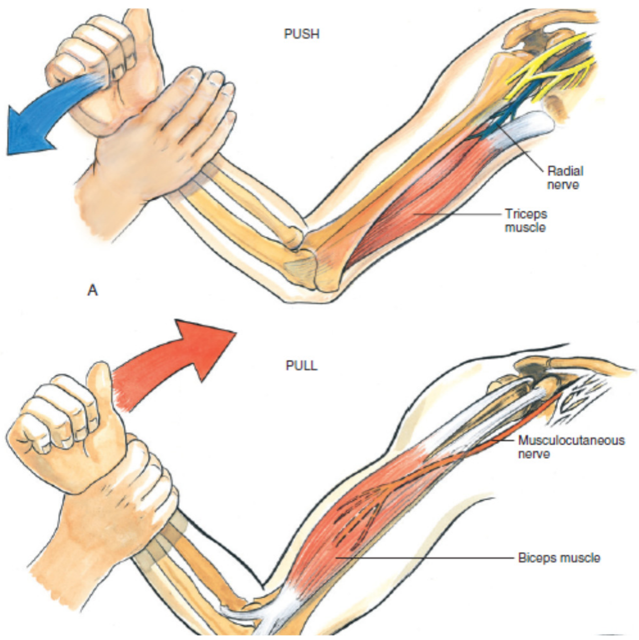


Figure 18 – Peripheral nerve innervation of supinated arm

CLINICAL PEARLS

To check the brachial plexus block before starting surgery, the "four Ps" are **push, pull, pinch, pinch** to check the four peripheral nerves in brachial plexus block.The musculocutaneous nerve is checked by pulling the forearm, thus the motor innervation to the biceps is assessed. By asking to push the forearm the triceps is assessed which is supplied by the radial nerve. Pinching the skin of the fifth digit denotes the blockade of ulnar nerve and pinching the skin of second digit denotes blockade of median nerve.In this method we can assess the blockade of four nerves of brachial plexus.



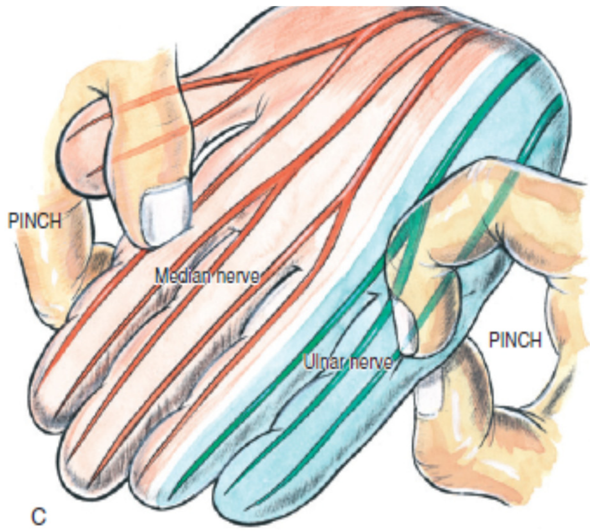


Figure 19 – Peripheral nerve function mneumonic

SONOANATOMY

During ultrasonographic needle guidance most nerves are imaged in short axis, because it allows the operator to assess the lateromedial perspective of the target nerve whis is lost in long axis view. In plane techniques are most commonly used because it allows full visualization of the shaft and tip of the needle.

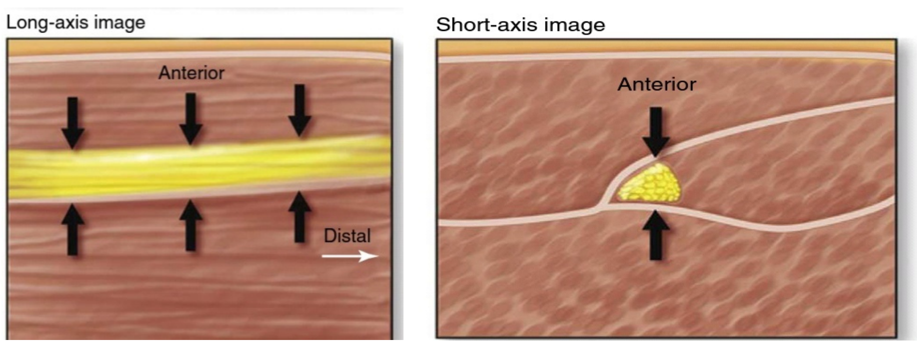


Figure 20 – Long and short axis image

In short axis view, the axillary artery is deep to the pectoralis major and minor muscles.The area of importance lies beneath the fascia of the pectoralis minor muscle. Around the artery, the three cords of the brachial plexus: lateral, posterior and medial cords. The cords are seen as round hyperechoic structures at approximately 9 o’clock (lateral cord), 7 o’clock (posterior cord), and 5 o’clock (medial cord) . The axillary vein is seen as a compressible hypoechoic structure that lies inferior, or slightly superficial to the axillary artery. The transducer is moved in the superior-inferior direction. Depending on the depth of field selected and the level at which the scanning is done, the chest wall and lung is seen in the inferior to the plexus. The axillary artery or brachial plexus are typically identified at a depth of 3-5cm.

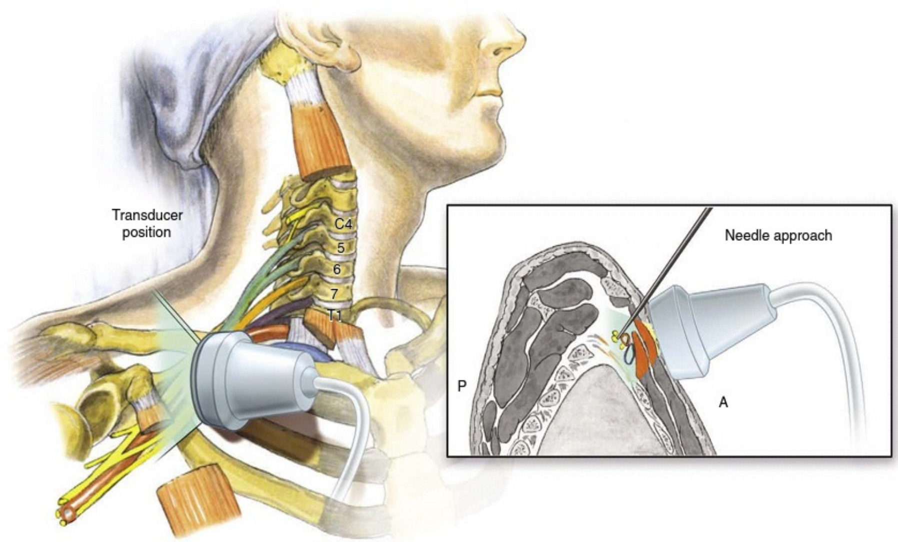


Figure 21 – Parasagittal view of infraclavicular block with anatomy

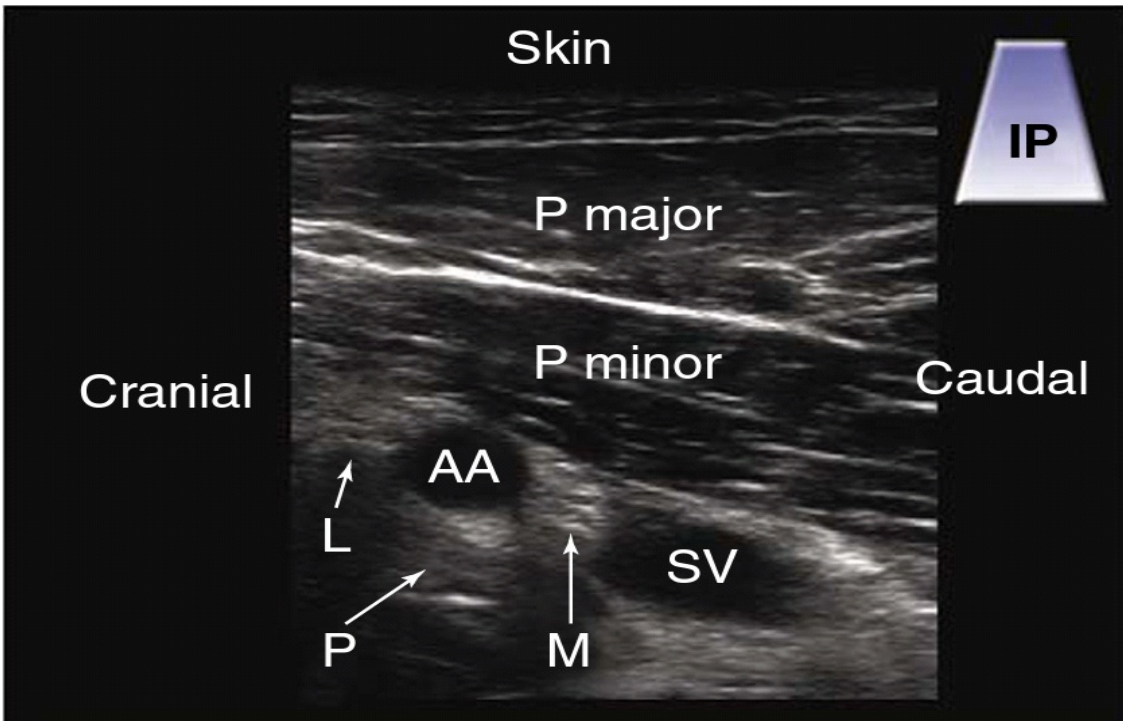


Figure 22 – Sonographic image of infraclavicular brachial plexus

Ultrasound-Guided Infra clavicular Brachial Plexus Block

INTRODUCTION : The advantage of infra clavicular plexus block is complete brachial plexus anaesthesia. The anaesthesia or analgesia obtained in this technique result in high axillary block. Both neuraxial structure and lungs are away, hence there are minimum complications associated.

The sonographic landmarks for infra clavicular block,

PROXIMAL	**OPTIMAL LOCATION**	**DISTAL**
Cephalic vein	Pectoralis minor	Subscapular artery
Thoracoacrominian artery	Brachial plexus cord around the axillary artery	Coracobrachialis
Chest wall and pleura	Posterior cord below axillary artery	Anterior and Posterior circumflex artery

EQUIPMENTS

1.Ultrasound machine with linear transducer probe (6-15 MHz)

2.sterile sleeve and gel 3.Standard nerve block tray 4. 20 to 30 mL of local anaesthetic drawn into the syringe 5.Sterile gloves 6.Intra lipid emulsion

ERGONOMICS FOR INFRACLAVICULAR BRACHIAL PLEXUS BLOCK

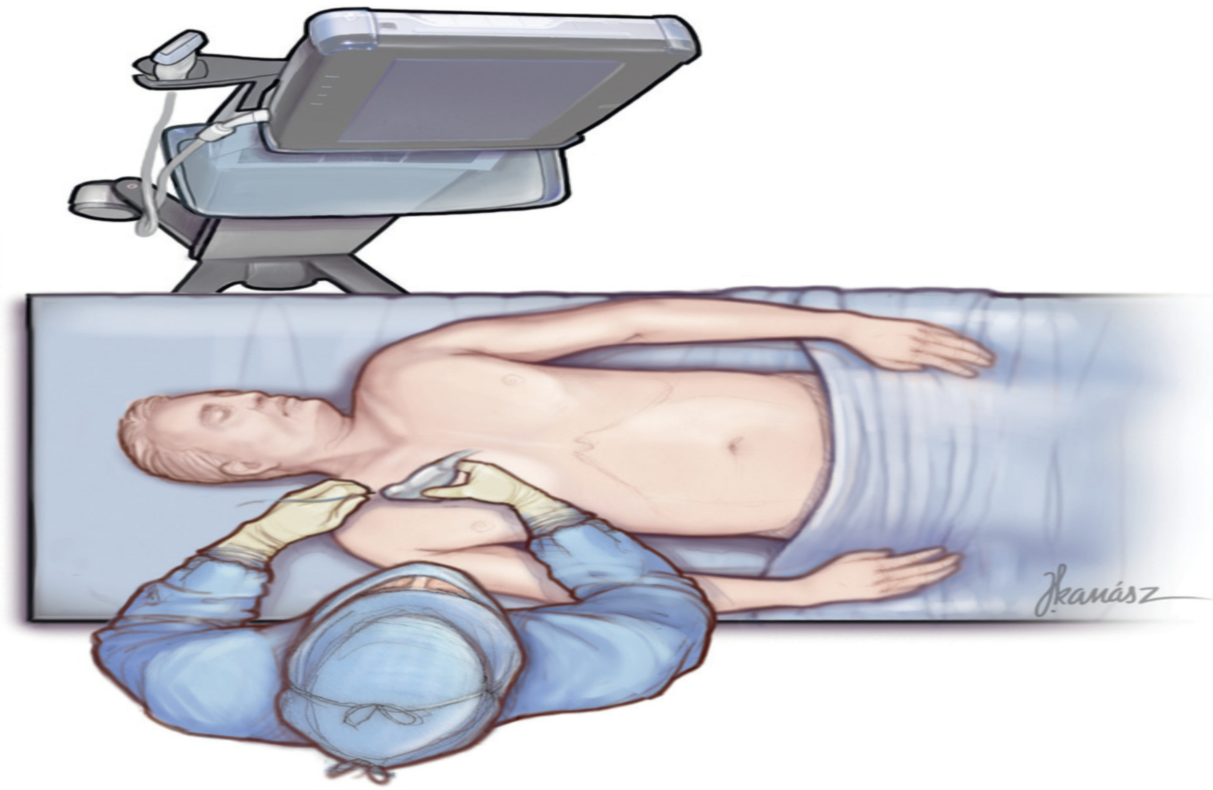


Figure 23

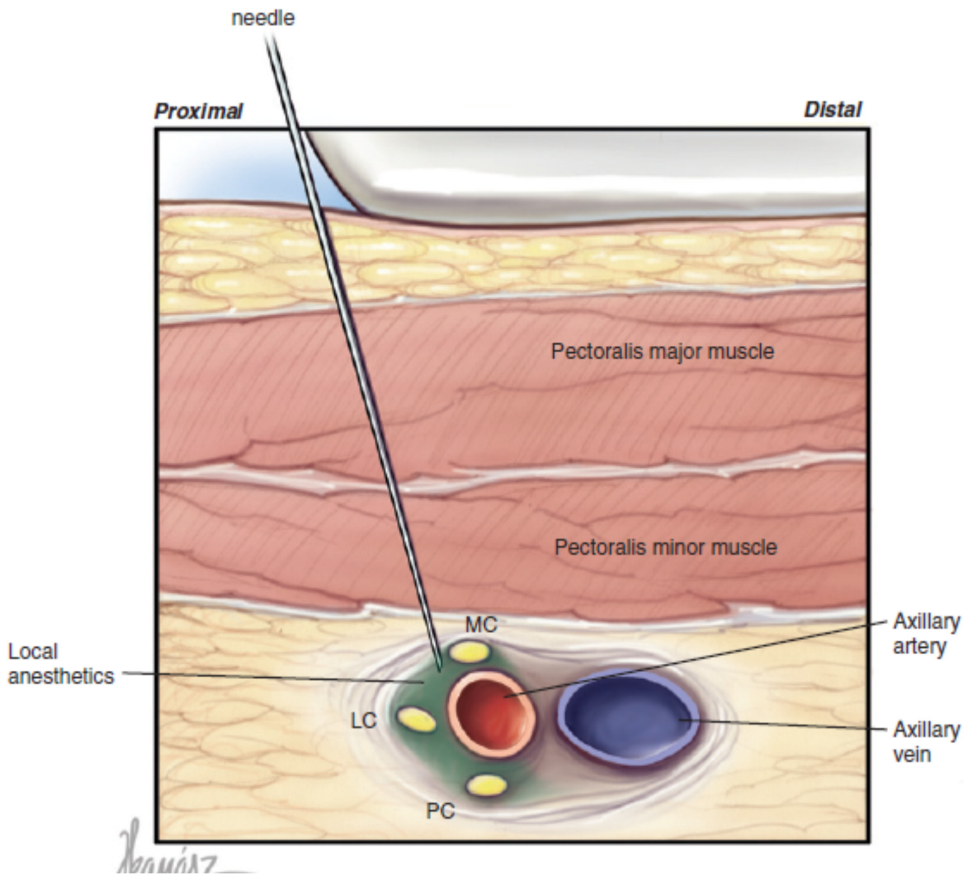


Figure 24 – Relation of cord in 1st part of axillary artery

ANAESTHETIC TECHNIQUE

POSITIONING AND LANDMARKS

Figure 25 – Positioning of parasagittal infraclavicular plexus block

The block is performed in the supine position with the head turned to the opposite side of the arm to be blocked. Some manoeuvres reduce the depth from the skin to the plexus for example the arm is abducted to 90° and the elbow is flexed. The coracoid process is an important landmark, the ultrasound probe is placed medial to the coracoid process and inferior to the clavicle.

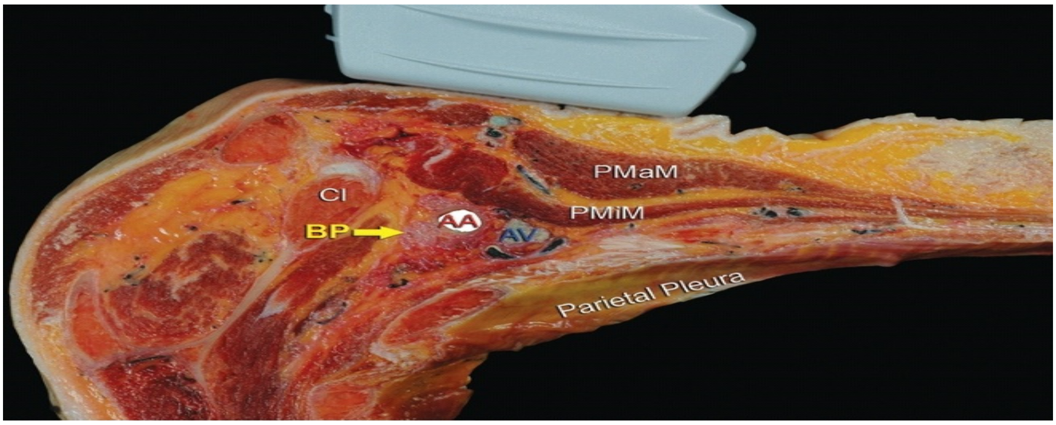


Figure 26 – Anatomy of infraclavicular brachial plexus with transducer

GOAL

To place the needle posterior to axillary artery and inject the local anaesthetic agent which makes a U-shaped distribution underneath the axillary artery.

TECHNIQUE

After placing the patient in proper position, the skin is disinfected and the transducer probe is positioned in parasagittal plane, just medial to the coracoid process to identify the axillary artery.

Adjustment of the depth, depends on the inter patient variability. It is usually 3 to 7cms.The artery is identified as pulsatile hypoechoic structure and then thehyperechoic cords of the brachial plexus are identified around this. The needle is introduced in-plane in the cephalad aspect, with the insertion point just inferior to the clavicle. **This is coracoid approach of infraclavicular block**. The needle pierces the pectoralis major and minor and is advanced towards the posterior aspect of the axillary artery.

If we use ultrasound guided peripheral nerve stimulator the first motor response occurs from the lateral cord which presents as elbow flexion or finger flexion. If the needle is further advanced below the artery, a posterior cord motor response which presents as finger and wrist extension is elicited. After aspiration, 1 to 2 mL of local anaesthetic is injected for confirmation of proper needle placement and spread.

When single injection spread is insufficient, additionally needle repositions and injections around the axillary artery is necessary.

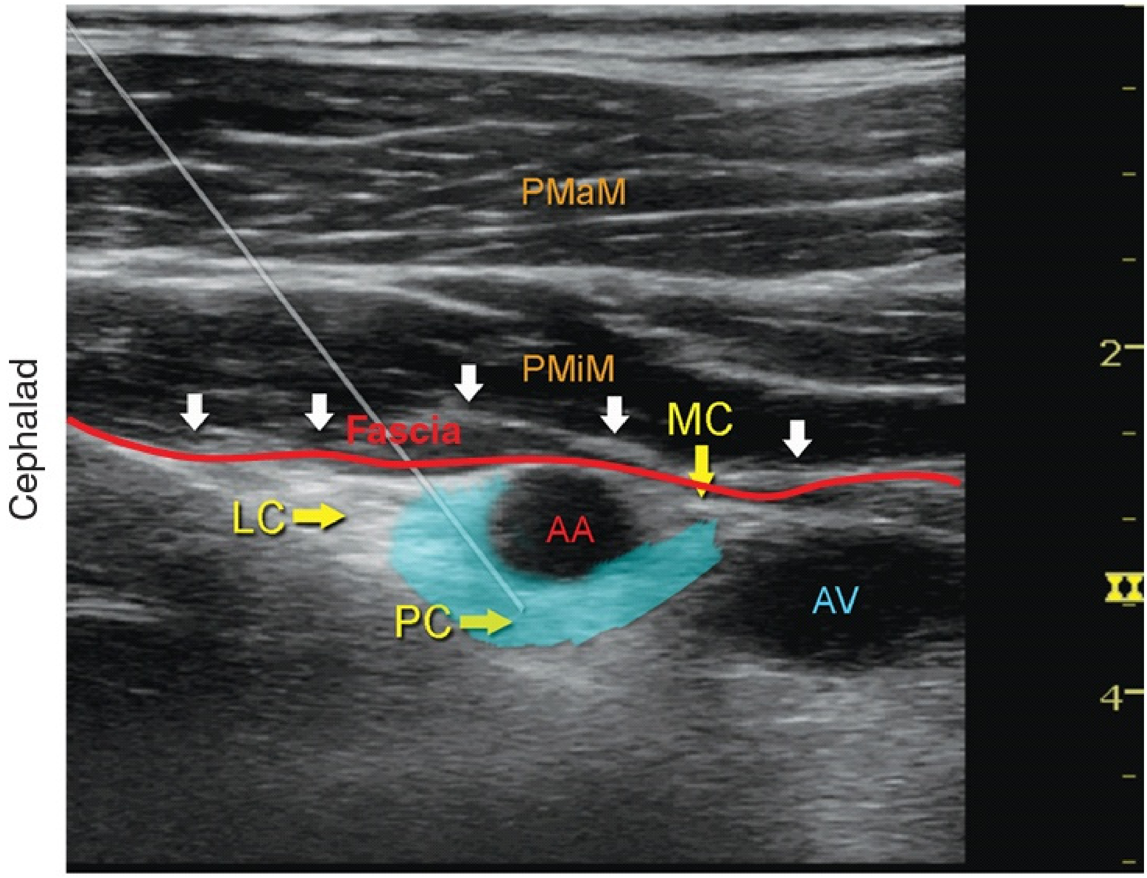


Figure 27 – Sonographic image demonstrating needle path

Sonographic signs showing successful infraclavicular block:

- U shaped distribution of local anaesthetic below the axillary artery
- Separation of all the three cords from the axillary artery
- Reduction in axillary artery diameter
- Whitish appearance of axillary artery

In long axis view, there is a dark streak below the axillary artery

Comparison of infra clavicular and axillary approach of brachial plexus block

	INFRACLAVICULAR BLOCK	AXILLARY BLOCK
Depth	Deep	Shallow
Onset	Slower	Faster
Torniquet tolerance	Better	Good
Catheter success	High	Low

TIPS:

To decrease the complication,

Do not change the transducer pressure during the procedure which accidentally causes intravascular injection

-Aspirate for every 5ml.

-Do not inject if the resistance is high

-Reverberation artefact is very common which can be overcome by changing the transducer direction and decreasing the frequency.

Disadvantages in this technique:

The infraclavicular block is a deeper block.

Needle and probe manipulation is often necessary.

The steep angle of needle insertion results in difficulty in needle tip visualization.

The clinical problem in infraclavicular block is the presence of accessory vein and arteries adjacent to the lateral cord

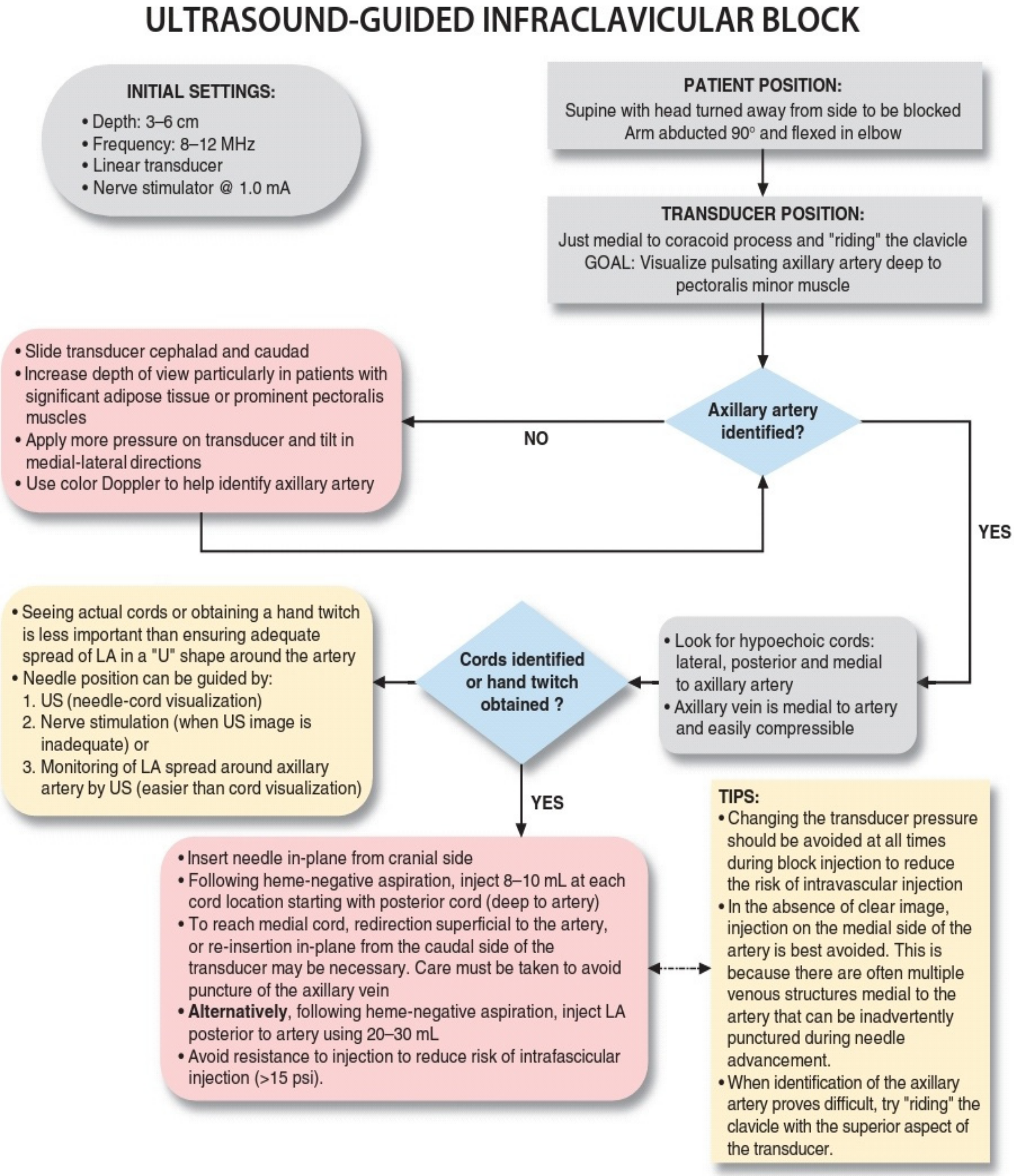
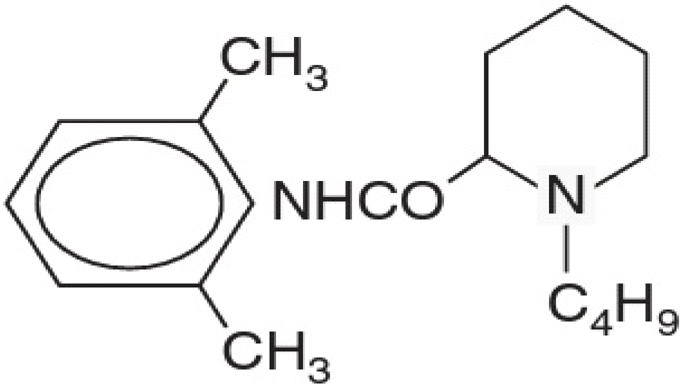

ULTRASOUND-GUIDED INFRACLAVICULAR BLOCK
INITIAL SETTINGS:
• Depth: 3–6 cm
• Frequency: 8–12 MHz
• Linear transducer
• Nerve stimulator @ 1.0 mA
PATIENT POSITION:
Supine with head turned away from side to be blocked
Arm abducted 90° and flexed in elbow
TRANSDUCER POSITION:
Just medial to coracoid process and "riding" the clavicle
GOAL: Visualize pulsating axillary artery deep to pectoralis minor muscle
Axillary artery identified?
NO
• Slide transducer cephalad and caudad
• Increase depth of view particularly in patients with significant adipose tissue or prominent pectoralis muscles
• Apply more pressure on transducer and tilt in medial-lateral directions
• Use color Doppler to help identify axillary artery
YES
• Look for hypoechoic cords: lateral, posterior and medial to axillary artery
• Axillary vein is medial to artery and easily compressible
Cords identified or hand twitch obtained ?
• Seeing actual cords or obtaining a hand twitch is less important than ensuring adequate spread of LA in a "U" shape around the artery
• Needle position can be guided by:
1. US (needle-cord visualization)
2. Nerve stimulation (when US image is inadequate) or
3. Monitoring of LA spread around axillary artery by US (easier than cord visualization)
YES
• Insert needle in-plane from cranial side
• Following heme-negative aspiration, inject 8–10 mL at each cord location starting with posterior cord (deep to artery)
• To reach medial cord, redirection superficial to the artery, or re-insertion in-plane from the caudal side of the transducer may be necessary. Care must be taken to avoid puncture of the axillary vein
• **Alternatively**, following heme-negative aspiration, inject LA posterior to artery using 20–30 mL
• Avoid resistance to injection to reduce risk of intrafascicular injection (>15 psi).
TIPS:
• Changing the transducer pressure should be avoided at all times during block injection to reduce the risk of intravascular injection
• In the absence of clear image, injection on the medial side of the artery is best avoided. This is because there are often multiple venous structures medial to the artery that can be inadvertently punctured during needle advancement.
• When identification of the axillary artery proves difficult, try "riding" the clavicle with the superior aspect of the transducer.

Figure 28

BUPIVACAINE

It was first synthesised by EKENSTAM in 1957 and introduced in 1963

It is a long acting amide group local anaesthetic. pH is 3-3.5



1-n-butyl-PL-piperidine-2-carboxylixacid-2,6dimethyamilidehydrochloride

The structure is similar to lignocaine except the amine containing group is butyl piperidine.

-More sensory than motor blockade

-More slowly absorbed than lignocaine

-Pka 8.1

Solubility:Base is sparingly soluble by hydrochloride but is readily soluble in water, lipid solubility is 28%.

Volume of distribution is 73litre.

Stable and can withstand repeated autoclaving.

Potency: 3 times than lidocaine, 8 times than procaine

Duration of action: 180 to 600 minutes

Anaesthetic index: potency/toxicity ratio is 3:4

Nerve block: small nerve 0.25%, large nerve 0.5%

Caudal: 0.25 – 0.5 %

Sub arachnoid: 0.5 – 0.75 % with dextrose

2ml ampoule of 0.75% as the pH of 4 – 6.5, specific gravity of 1.0235

Dosage: 200mg without adrenaline, 250mg with adrenaline

Plasma toxic level is > 3mic/ml

Alpha half-life: 2-5 hours

Beta half-life: 4-5 hours

95% bound to globulin

Alpha 1 acid glycoprotein is important plasma protein site of bupivacaine

Metabolised in the liver by de-alkylation

Placental transfer is insignificant due to high protein binding capacity

Systemic effect at low level cause vasoconstriction and at high level cause vasodilation.

Sympathetic effect by beta 2 blocker, no effect on alpha receptor

It is more cardio toxic than lignocaine which can produce malignant ventricular arrhythmia, the cardiotoxic dose is 8-10mic/ml

Drowsiness occur at 1.5mic/ml

Peripheral paraesthesia occur at 2mic/ml

Convulsion occur at 4mic/ml

Recently liposomal derivative of bupivacaine was approved by FDA

Shivering is more common after epidural due to lack of tachyphylaxis.

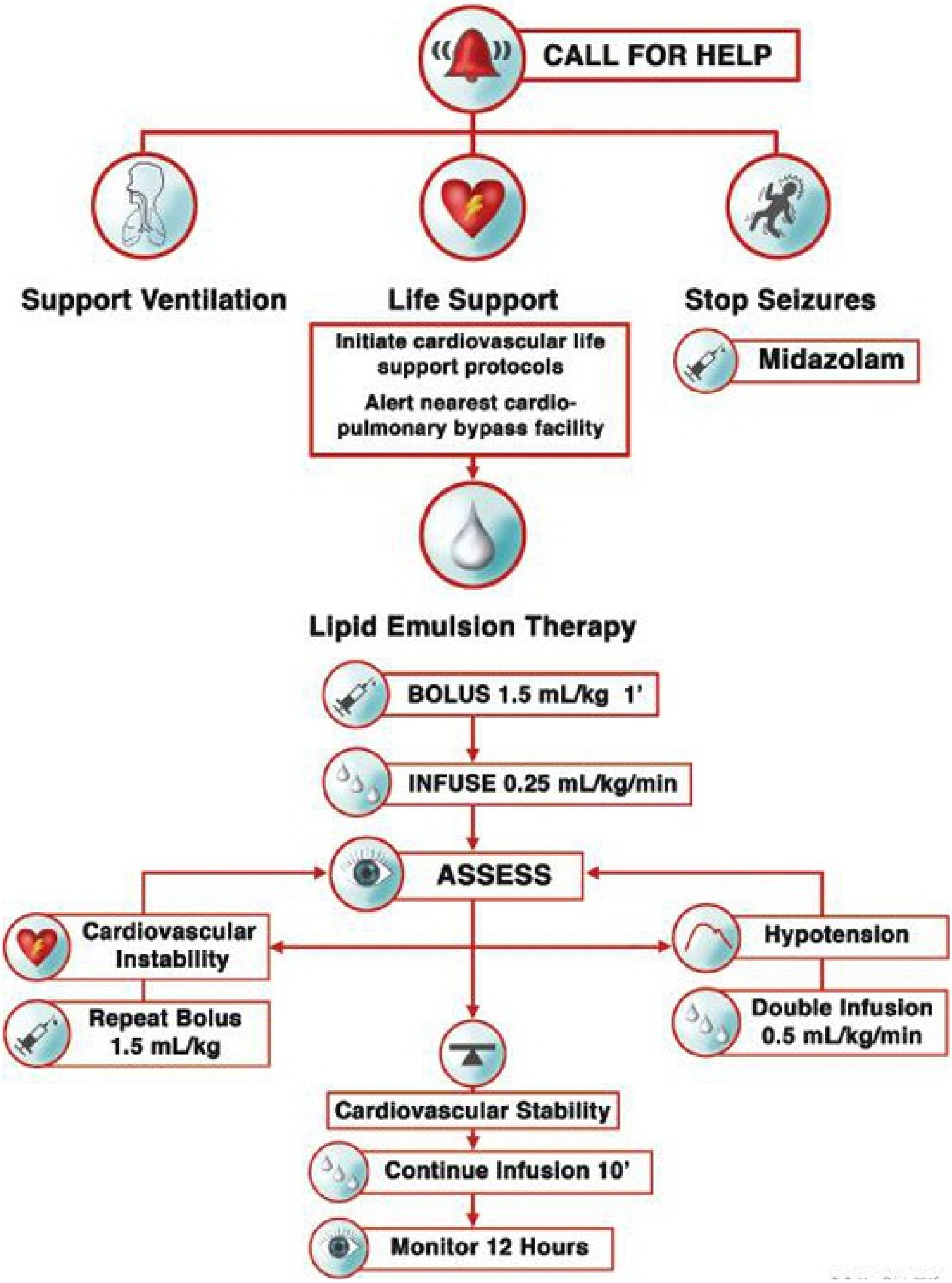


Figure 29 - Checklist for management of local anaesthetic systemic toxicity

The following are the American Society of Regional Anaesthesiologists recommendations for performing an ultrasonography-guided block:

Visualize key landmarks which are muscles, fascia and blood vessels

Identify the nerves or plexus on short-axis view, with the depth setting of 1 cm deep to the target nerve.

Confirm the normal anatomy and its variation.

Plan the safest and most effective needleapproach.

Use the aseptic needle insertion technique.

Follow the needle under visualization and advanced toward the target.

Consider an alternative confirmation technique, such as nerve stimulation.

If the needle tip is assumed to be in the correct position, inject a small volume of a test solution (hydro dissection)

Make needle adjustments to obtain the clear perineural spread of local anaesthetic.

Maintain safety guidelines, frequent aspiration, standard monitoring, patient response, assess the resistance to the injection

REVIEW OF LITERATURE

1. The study titled Infra clavicular brachial plexus block (ICB) for regional anaesthesia of the lower arm was conducted .To evaluate the efficacy and safety of infra clavicular brachial plexus block compared to other brachial plexus block in providing regional anaesthesia of the lower arm.we studied the primary outcome was adequate surgical anaesthesia within 30 minutes of block completion. Secondary outcomes included sensory block of individual nerves, tourniquet pain, onset time of sensory blockade, block performance time, block-associated pain and complications related to the block. Infra clavicular brachial plexus block is a safe and simple technique for providing surgical anaesthesia of the lower arm, with an efficacy comparable to other BPBs. The advantages of infra clavicular brachial plexus block include a lower likelihood of tourniquet pain during surgery, and more reliable blockade of the musculocutaneous and axillary nerves when compared to a single-injection axillary block. The efficacy of infra clavicular brachial plexus block is likely to be improved if adequate time is allowed for block onset (at least 30 minutes) and if a volume of at least 40 ml is injected.

2. The study titled Proximal approach for ultrasound-guided infra clavicular brachial plexus block was conducted Infra clavicular brachial plexus block (ICB) is performed between the clavicle and axilla and can be used for surgical

procedures performed below the mid humerus. Various ultrasound-guided Infra clavicular brachial plexus block approaches generally indicate the distal approach. In this approach, an ultrasound transducer is placed near the coracoid process in the sagittal plane, and the distinct lateral, posterior, and medial brachial plexus cords, which surround the axillary artery, are visualized. Multiple injections are recommended to ensure a block in all cords. However, controversy exists because a single injection posterior to the axillary artery has been demonstrated to provide a more reliable blockade in comparison with multiple injections into the three distinct cords.All three cords are not always identifiable by ultrasonography in the distal approach because of their variable and relatively deeper locations. In the proximal approach, which is frequently described in Japanese literature, the linear transducer is placed adjacent to the inferior border of the clavicle, parallel to the clavicle, and lateral to the mid clavicular line.As the transducer is moved from the distal approach position to this position, the cords become relatively superficial and cluster laterally to the first part of the axillary artery. Accordingly, multiple injections toward each cord are unnecessary in the proximal approach. A needle is inserted laterally to medially toward the clustered cords, in plane with the transducer. All three cords can be blocked by a single local anaesthetic injection . We believe that, compared with the distal approach, the proximal approach for ultrasound-guided Infra clavicular brachial plexus block is promising with respect to the reduced number of needle passes and the effectiveness of continuous block; therefore, we encourage a future randomized controlled trial.

3. The study titled Ultrasound-guided infra clavicular brachial plexus block : An alternative technique to anatomical landmark-guided approaches was conducted.

Infra clavicular brachial plexus block has been used less than other approaches because of its less uniform landmarks and the necessity of a longer needle, which increases the patient's discomfort. To overcome these drawbacks, they applied ultrasound guidance to infra clavicular approach and prospectively evaluated its feasibility and usefulness in 60 patients undergoing upper extremity surgery. An adequate ultrasound image was obtained for all the patients. Surgery was performed without supplementation of any other anaesthetics or analgesics. The complete sensory block was obtained in 100% of patients for the musculocutaneous and medial ante brachial cutaneous nerves, 96.7% for the median nerve, and 95% for the ulnar and radial nerves. The complete motor block was achieved in 100% of patients for the musculocutaneous nerve, 96.7% for the median nerve, 90% for the ulnar nerve, and 93.3% for the radial nerve. No evidence of any complications was identified. We conclude Real-time ultrasound guidance facilitates accurate infraclavicular approach to the brachial plexus. It could be used as an alternative to the landmark-guided techniques.

4. The study titled Is ultrasound guidance superior to conventional nerve stimulation for coracoid infra clavicular brachial plexus block was conducted the hypothesis that ultrasound guidance improves onset time of coracoid infra clavicular brachial plexus block (IBPB) when compared with a nerve stimulation-guided technique. Seventy patients scheduled for hand or forearm surgery were randomly assigned to receive coracoid Infra clavicular brachial plexus block using either ultrasound guidance or nerve stimulation. Patients were assessed for sensory and motor block every 5 mins after injection of local anaesthetic. Onset time, the primary end point, was defined as the time required for complete sensory and motor block. Time required to perform the block, success rate, and time to resolution of motor blockade were also recorded .we conclude . The present investigation demonstrates that ultrasound guidance and nerve stimulation provide similar onset time, success rate, and duration of motor blockade for coracoid Infra clavicular brachial plexus block; however, ultrasound guidance reduces the time required to perform the block.

5 . The ease of the novel retroclavicular block was thoroughly described in this technique. Needle tip and shaft visibility, needling time, procedural discomfort, motor block success rate, patient satisfaction at 48-hour Fifty patients scheduled for distal upper limb surgery received an in-plane, single-shot, ultrasound-guided retroclavicular block with 40 mL of mepivacaine 1.5% with epinephrine 2.5 μg/mL. Block success was defined as a sensory score of 10/10 for the 5 nerves supplying the distal upper limb at 30 minutes. Surgical success, needle

visibility, needling time, axillary artery depth, motor block rate, patient discomfort with technique, satisfaction at 48 hours, and complications were also recorded. . Forty-five patients had a total sensory score of 10/10 at 30 minutes In this study, the novel retroclavicular block offered a quick, safe, and reliable alternative for distal arm block. Further studies, comparing this approach with the classic infraclavicular block, are required to validate its efficacy, safety, and reliability.

6 .At the infraclavicular level, the brachial plexus is deeper compared to its proximal course, giving rise to impaired needle visualisation due to the steep angle of needle insertion with ultrasound-guided approach. A new posterior parasagittal in-plane ultrasound-guided infraclavicular approach was introduced to improve needle visibility. However no further follow up study was done.

All patients had 100 % success rate. The imaging time, needling time and performance time were comparable with previously published study. There were no adverse events encountered in this study. The cadaveric dissection revealed a complete spread of methylene blue dye over the brachial plexus..

7 . The study titled a prospective, randomized comparison between ultrasound-guided supraclavicular, infraclavicular, and axillary brachial plexus blocks was conducted for upper extremity surgery of the elbow, forearm, wrist, and hand. No differences were observed between the 3 groups in terms of total anesthesia-related time Success rate ,block-related pain scores, vascular puncture, and paresthesia. Compared with the supraclavicular and infraclavicular approaches,

ultrasound-guided axillary blocks required a higher number of needle passes ,a longer needling time and a longer performance time . we conclude Adjunctive ultrasonography results in similar success rates, total anesthesia-related times, and block-related pain scores for the supraclavicular block, Infra clavicular brachial plexus block, and axillary block

BACKGROUND :

Infra clavicular brachial plexus block is performed for upper limb surgery. The aim of this randomized control study is to compare the coracoid and retro clavicular approaches to ultrasound guided infra clavicular brachial plexus block (IBPB) in terms of needle tip and shaft visibility and quality of block and hence the time for performing the block and the complications.

MATERIALS AND METHODS

This is a prospective randomised double blinded case control study conducted in GOVT RAJAJI HOSPITAL MADURAI, after approval of institutional ethical committee.

A written informed consent was obtained from each patient after explaining the technique before including in this study.

A total of 100 adult patients who received IBPB block for upper limb surgery were randomized into two groups by computer generated randomised number :

GROUP R - A retro clavicular approach

GROUP C- A coracoid approach

INCLUSION CRITERIA :

Adult patients >18 ,BMI<35 posted for elective upper limb surgeries

EXCLUSION CRITERIA :

1. Patients with history of bleeding disorders or patients on anticoagulant therapy
2. Patient's refusal
3. Patients with local infection
4. Patients with known allergy to local anaesthetic drugs
5. Psychiatric illness

ANAESTHETIC TECHNIQUE:

In the operating room, all the patients were secured with 18G iv line, iv fluids started.

Standard monitoring including non invasive blood pressure, Five-lead electro cardiography, and pulse-oximetry was used. Patients were premedicated with a 0.05 mg/kg intravenous bolus of midazolam 5 min before the block.

A18-gauge 100 mm needle was used for the blocks. Patients were positioned in supine, the arm was adducted, and the head was rotated to the contralateral side of the blockade. Before all ofthe blocks, the skin was cleaned with disinfected and the skin and subcutaneous tissue were anesthetized with 2–4 ml of 1% lignocaine.

A sonosite ultrasound machine with a 10-15HZ – High frequency linear probe with a sterile cover was used to perform the blocks.

In both the groups – The Ultrasound probe was placed para sagitally just medial to the coracoid process and caudal from the clavicle.

GROUP C - The needle was inserted cephalad to the ultrasound

Probe below the clavicle using in-plane technique and advanced in a caudal direction toward the posterior aspect of the axillary artery, in the vicinity of the posterior cord of the brachialplexus.

GROUP R - The needle insertion point was located in the Supraclavicular fossa, just medial to the shoulder at a point posterior to the clavicle and medial to the trapezius muscle insertion point on the clavicle. The needle was inserted immediately above the clavicle in the space between the coracoid process and the clavicle and advanced from cephalad to caudal.

DOSAGE OF DRUG: In both the groups ,The blocks were performed by administering 25 ml bupivacaine 0.5% at the 6-o'clock position with respect to the axillary artery with the aim of providing a U-shapedspreadaround the vessel

PARAMETERS MONITORED –

1. NEEDLE TIP VISIBILITY –

   1 – very poor

   2 – poor

   3 - fair

   4 – good

   5 – very good

2. NEEDLE SHAFT VISIBILITY –

   1 – none of the shaft is visible

   2 - only a small segment is visible

   3 – less than half of the shaft is visualized

   4 – almost all of the shaft is visible

   5 – entire shaft is visible

3. Sensory blockade –

   1 – can feel touch not cold

   2 – cannot feel touch and cold

4. Motor blockade –

   0-no block

   1-Paresis

   2- Paralysis

We evaluated both sensory and motor blockade at the time interval of

5^{th} min	10^{th} min	15^{th} min	20^{th} min	25^{th} min	30^{th} min

5. Number of needle passess(> 2 was considered failure)

6. Block performance time - in minutes

(time from first insertion of the blocking needle till removal after drug deposition)

7. Onset time

8. Total anaesthesia related time (sum of block performance and onset time)

9. Block performance related pain –

VRS scale

0 1 2 3 4 5 6 7 8 9 10

10. Complications –

1. Paraesthesia
2. Vascular puncture
3. Pneumothorax
4. Dyspnea
5. Symptoms of local anaesthetic toxicity

STATISTICAL ANALYSIS

The sample size was calculated to be 100 for a power of 80%, with significance of 0.05 – p value which is the alpha error.

- Continuous data are represented as mean ± S.D.
- Ordinal variables and represented as median and range
- Categorical variables are represented as number and percentage
- For continuous data – Students t test is used
- For categorical data – CHISQUARE test
- For ordinal data – Mann – Whitney and Wilcoxon test
- p – value < 0.05 – statistically significant.
- Each of the parameter was analyzed and the statistical significance was calculated.

Table 1

AGE DISTRIBUTION

AGE DISTRIBUTION, (IN YEARS)	GROUP R	GROPU C
<25	8	9
25-50	27	31
>50	15	10
MEAN	42.78	42
S.D	14.8	15.7
p VALUE	0.8190	

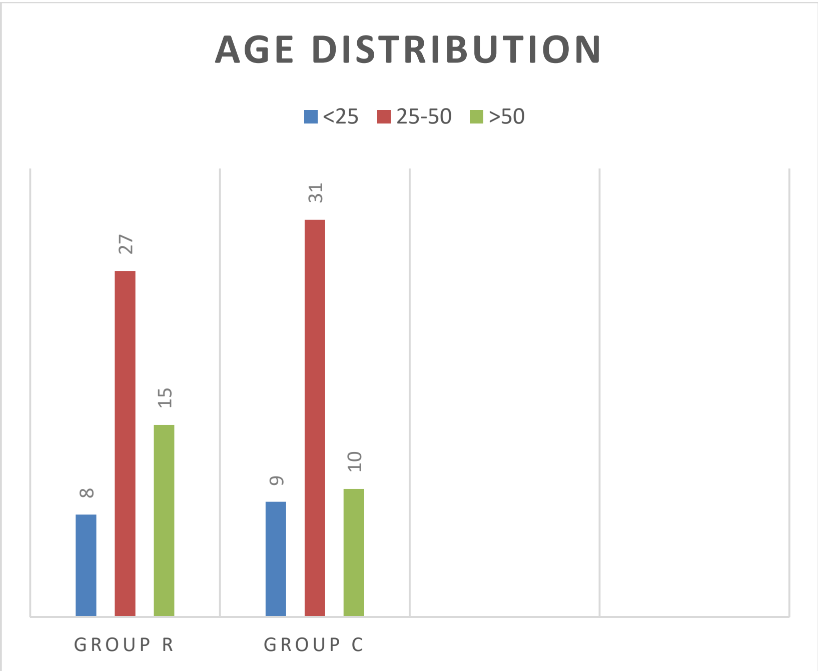


Table 2

SEX DISTRIBUTION

SEX DISTRIBUTION	GROUP R NUMBER (%)	GROUP C NUMBER (%)
MALE	28(56%)	26(52%)
FEMALE	22(44%)	24(48%)

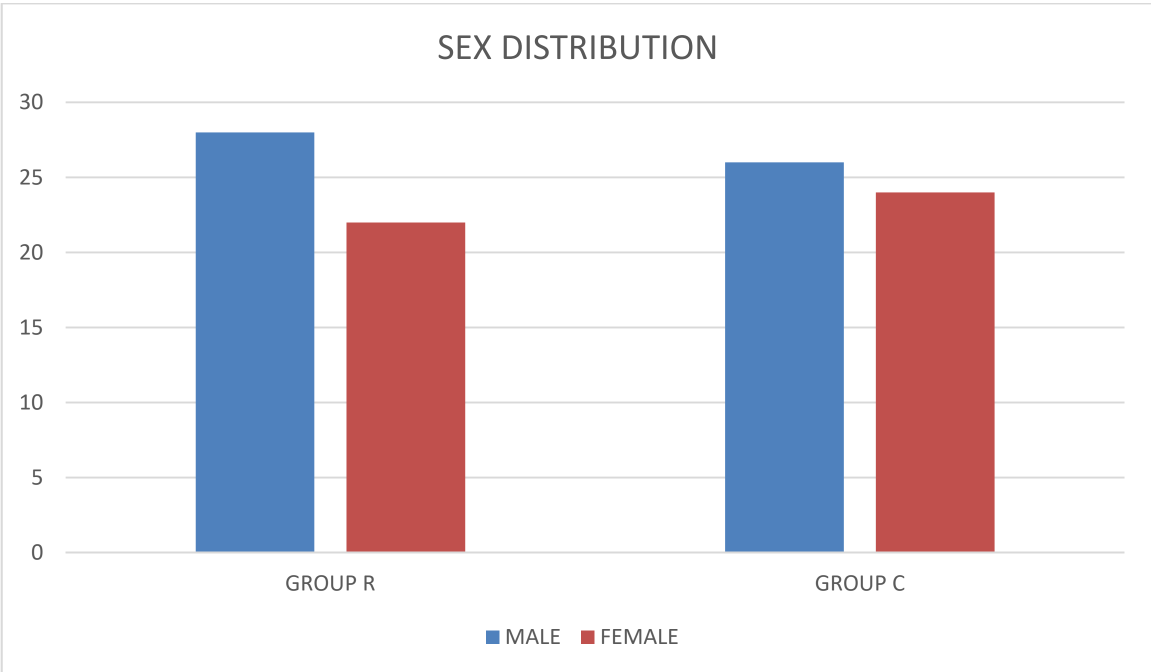


Table 3

WEIGHT DISTRIBUTION

WEIGHT DISTRIBUTION	GROUP R	GROUP C
<50	4	6
>50	46	44
MEAN	64.14	61.15
S.D	9.3	8.6
P VALUE	0.1438	

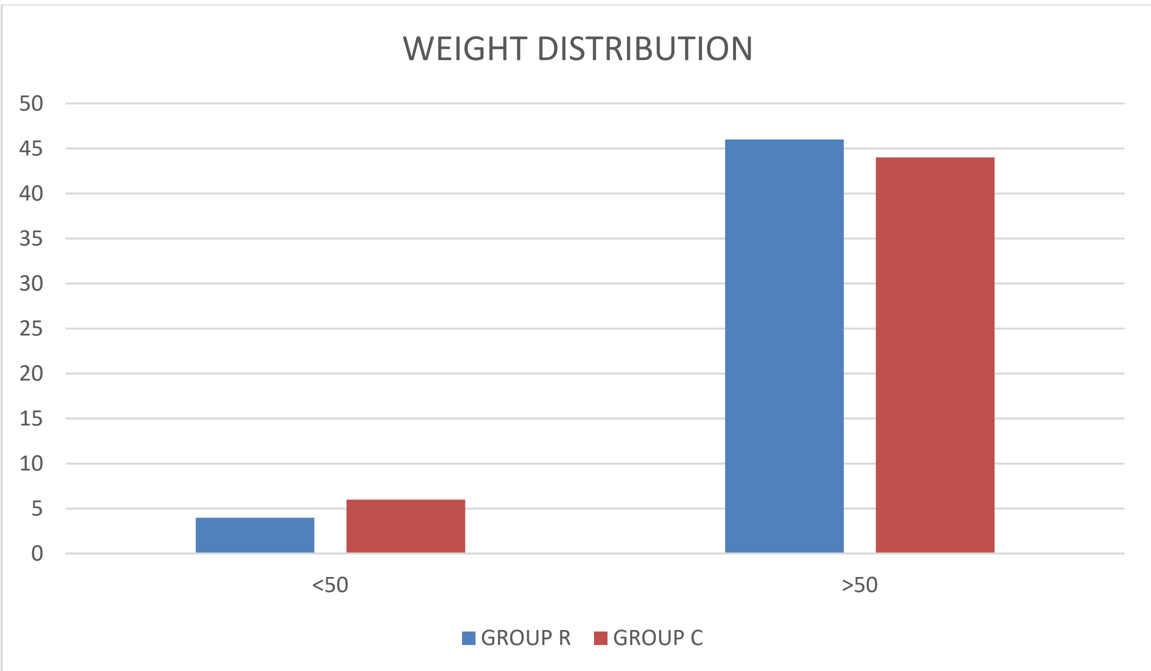


Table 4

HEIGHT DISTRIBUTION

HEIGHT DISTRIBUTION	GROUP R	GROUP C
MEAN	1.55	1.57
S.D	0.13	0.11
P VALUE	0.408	

Table 5

BMI DISTRIBUTION

BMI DISTRIBUTION	GROUP R	GROUP C
<24	17	21
24-29	16	17
>29	17	12
MEAN	26.98	24.98
S.D	6.70	4.43
P VALUE	0.0814	

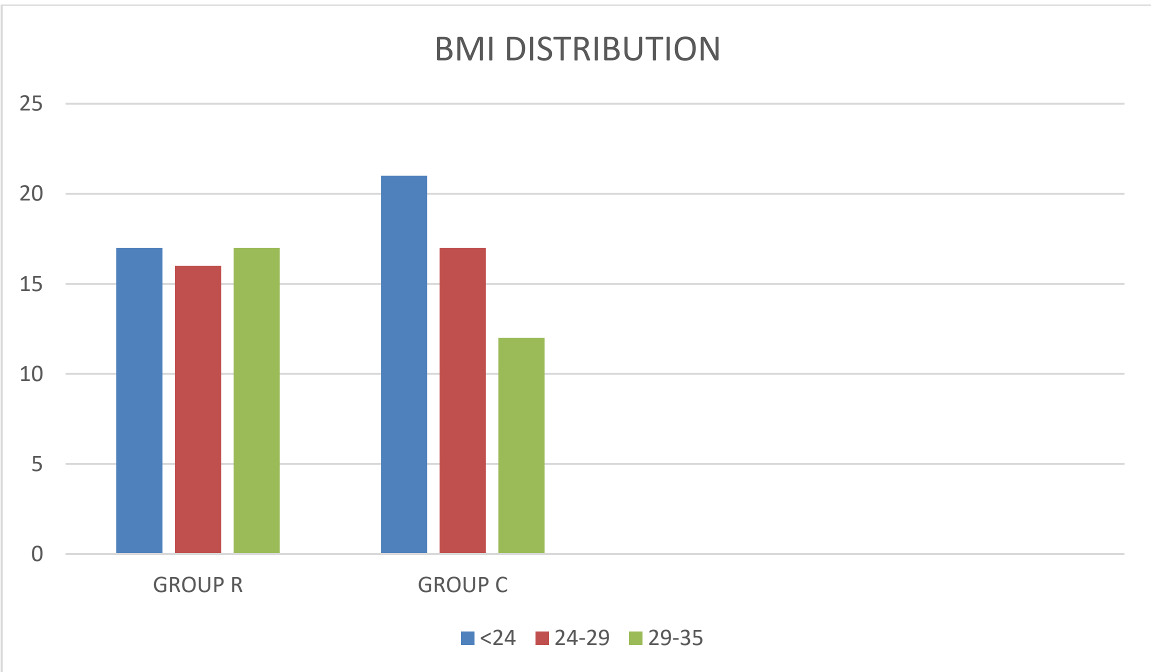


Table 6

ASA DISTRIBUTION

ASA	GROUP R	GROUP C
I	26	26
II	20	19
III	4	5
IV	0	0

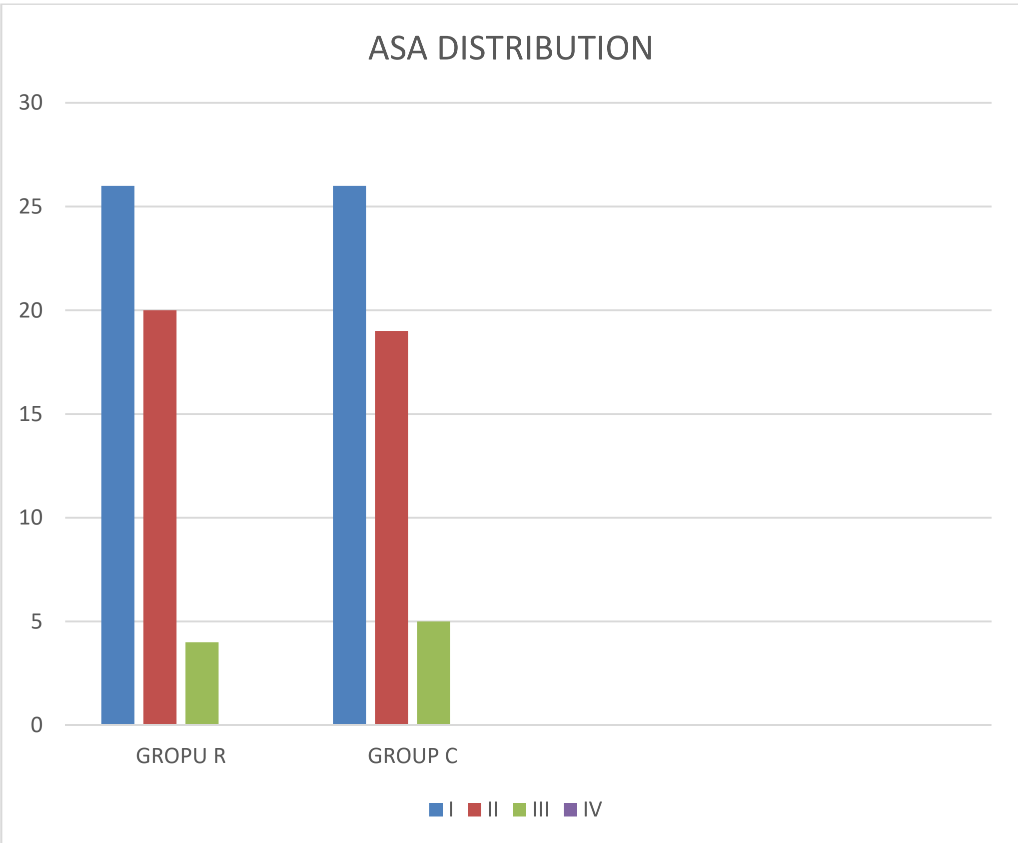


Table 7

DEMOGRAPHIC DISTRIBUTION

CHARACTERISTIC	GROUP R	GROUP C
AGE	42.78±14.8	42±15.7
SEX(M/F), n (%)	28/22(56/44)	26/24(52/48)
HEIGHT, m	1.5±0.13	1.57±0.11
Weight	64.14±9.3	61.15±8.6
BMI(kg/m^2)	26.98±6.7	24.98±4.4
ASA(I/II/III/IV)	26/20/4/0	26/19/5/0

Table 8

NEEDLE TIP VISIBILITY

Needle tip visibility	Group R	GROUP C
MEDIAN	4	3
RANGE	3-5	1-5
P value	0.0001	

Table 9

Needle shaft visibility

Needle shaft visibility	Group R	Group C
MEDIAN	4	2
RANGE	3-5	1-5
P VALUE	0.0001	

Table 10

Number of needle passes

Number of needle passes	Group R	Group C
MEDIAN	1	3
RANGE	1-2	2-4
P VALUE	0.0001	

Table 11

BLOCK PERFORMANCE TIME

BLOCK PERFORMANCE TIME	GROUP R	GROUP C
MEAN	2.8	5.8
S.D	1.48	1.18
P VALUE	0.0001	

Table 12

ONSET TIME

ONSET TIME	GROUP R	GROUP C
MEAN	17.36	18.21
S.D	2.6	2.07
P VALUE	0.0736	

Table 13

TOTAL ANAESTHESIA RELATED TIME

TOTAL ANEASTHESIA RELATED TIME	GROUP R	GROUP C
MEAN	17.74	21.3
S.D	1.2	2.1
p VALUE	0.0001	

Table 14

SENSORY BLOCK SUCCESS RATE

SENSORY BLOCK SUCCESS	GROUP R	GROUP C
NUMBER (%)	47(94%)	44(88%)
p VALUE	0.29	

Table 15

MOTOR BLOCK SUCCESS RATE

MOTOR BLOCK SUCCESS RATE	GROUP R	GROUP C
NUMBER (%)	46(92%)	44(88%)
p VALUE	0.51	

Table 16

SURGICAL SUCCESS RATE

SURGICAL SUCCESS RATE	GROUP R	GROUP C
NUMBER (%)	47(94%)	44(88%)
p VALUE	0.29	

Table 17

BLOCK RELATED PAIN

BLOCK RELATED PAIN	GROUP R	GROUP C
MEDIAN (RANGE)	2.5(1-4)	3(1-4)
p VALUE	0.55	

Table 18

PATIENT SATISFACTION

PATIENT SATISFACTION	GROUP R	GROUP C
MEDIAN (RANGE)	3(2-4	3(3-4)
p VALUE	0.40	

Table 19

SUPPLEMENTAL LOCAL ANAESTHETIC

SUPPLEMENTAL LOCAL ANAESTHETIC	GROUP R	GROUP C
NUMBER (%)	3(6%)	6(12%)
p VALUE	0.29	

Table 20

USE OF ANALGESIC

USE OF ANALGESIC	GROUP R	GROUP C
NUMBER (%)	**3(6%)**	**6(12%)**
p VALUE	**0.29**	

Table 21

	SENSORY BLOCK SUCCESS RATE					
	5 min	10 min	15 min	20 min	25 min	30 min
Group R, n%	2(4)	4(8)	24(48)	34(68)	46(92)	49(98)
Group R, n%	0(0)	4(8)	21(42)	33(66)	41(82)	45(90)
P value	0.15	1.0	0.54	0.83	0.13	0.09

Table 22

MOTOR BLOCK SUCCESS RATE					
5 min	10 min	15 min	20 min	25 min	30 min
0(0)	4(8)	10(20)	21(42)	43(86)	46(92)
0(0)	3(6)	10(20)	27(54)	39(78)	44(88)
1.0	0.69	1.0	0.23	0.30	0.50

Table 23

Characteristics	**Group R (N=50)**	**Group C (N=50)**	**P-value**
Needle tip visibility, median (range)	4.0(3-5)	3.0(1-5)	0.0001
Needle shaft visibility, median (range)	4.0(3-5)	2.0(1-5)	0.0001
Number of needle passes, Median (range)	1.0()	3.0(2-4)	0.0001
Sensory block Number (%)	0-3(6%) 1-47 (94%)	0-6(12%) 1-44(88%)	0.29
Motor block Number (%)	0-4(8%) 1-46 (92%)	0-6(12%) 1-44(88%)	0.51
Surgical success Number (%)	0-3(6%) 1-47 (94%)	0-6(12%) 1-44(88%)	0.29
Block related pain, median (range)	2.5(2-3)	3.0(2-3)	0.55

Characteristics	**Group R (N=50)**	**Group C (N=50)**	**P-value**
Patientsatisfaction, Median (range)	3.0(2-4)	3.0(3-4)	0.40
Supplement LA Number (%)	0-44(94%) 1-3 (6%)	0-44(88%) 1-6(12%)	0.29
Use of analgesic Number (%)	0-47(94%) 1-3 (6%)	0-44(88%) 1-6(12%)	0.29
ONSET TIME	17.36±2.6	18.2±2.07	0.0736
BLOCK PERFORMANCE TIME	2.8 ±1.48	5.8±1.18	0.0001
TOTAL ANAESTHESIA RELATED TIME	17.7±1.2	21.3±2.1	0.0001

RESULTS

A total of 100 patients were enrolled and randomized into two groups. The two groups were group R– retro clavicular approach and group C, the coracoid approach.

There were no significant differences between the groups with respect to age, weight,height,BMI and ASA. Males and females were almost evenly distributed between the two groups.

Significantly better needle tip visibility was obtained in group R than in group C ($p = 0.0001$). Needle shaft visibility was significantly better in group R than ingroup C ($p = 0.0001$). Block performance time was statistically shorter in group R (2.8±1.4 in minutes) when compared to group C (5.8±1.1 in minutes) with p VALUE of 0.0001. The anaesthesia-related timewas statistically shorter in group R (17.7 ± 1.2) vs (21.3±2.1) with a p VALUE of 0.0001). The number of needle passes was significantly lower in group R ($p = 0.0001$)

Three patients in group R and six patients in group C felt mild pain after skin incision, so additional intravenous analgesicand 3–5 ml of additional 1% lidocaine infiltrationwas administered by the surgeon to these patients. Due to the level of pain felt, two patients in group R could not tolerate the surgery despite additional analgesic and local anaesthetic, and general anaesthesia was necessary. No statistically significant differences were observed between the two groups in sensory block success, motor block success, surgical success, onset time, block-related pain and patient satisfaction.

DISCUSSION

The randomized prospective control study demonstrated that needle tip and shaft visibility was significantly better with the retro clavicular– GROUP R approach to Infraclavicular brachial plexus than with the coracoidapproach GROUP C. Furthermore, block and anaesthesia-related times were significantly shorter, and the number of needle passeswas significantly better in the retro clavicular approach, though the sensory and motor block success rates were similar in both approaches. The surgical success rate was not significantly better.

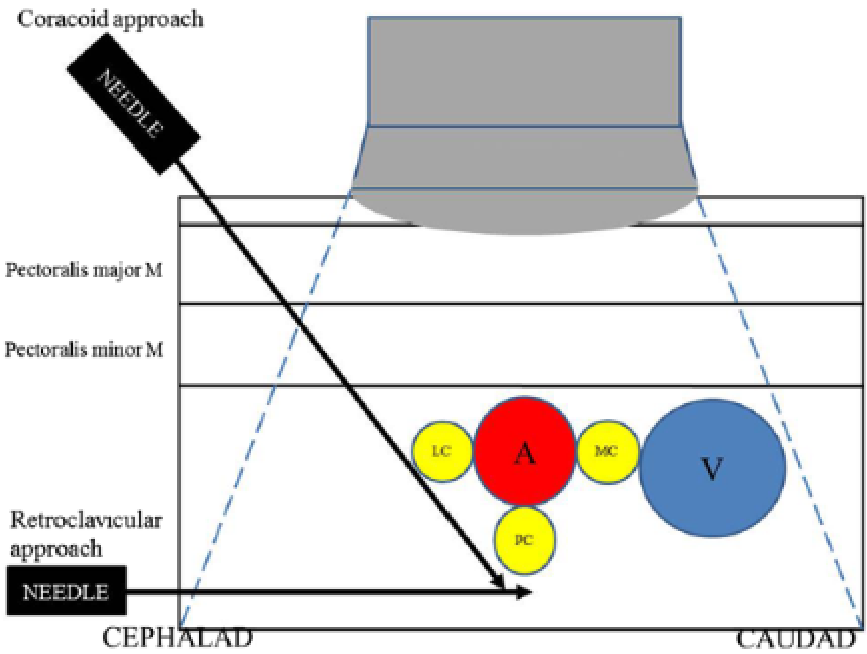


Figure 30 – Diagram showing coracoid and retroclavicular approaches

The inability to accurately keep track of the needle tip may be a contributing factor to procedural complications.

In the retro clavicularapproach, the needle path lies in a plane parallel to the probe and the needle shaft is aligned perpendicular to the ultrasound beam.This increases needle tip and shaft visibility. Better needle visibility

provides guaranteed needle orientation, thereby avoiding injury to several critical neurovascular structures. The cephalic vein and acromial branch of the thoracoacromial artery are exposed to needle trauma during the coracoid approach because these structures are along the needle path. The retro clavicular approach keeps the needle well away from these neurovascular structures.

Therefore, rates of needle trauma and paraesthesia during block performance may be lower in the retro clavicular approach.

Theortically in the retro clavicular approach, the needle path avoids the puncture of the pectoralis major and minor, which results in less pain during the procedure. The procedure-related discomfort in that study was recorded.Both the retro clavicular and coracoid approaches were also found to be similar in terms of block-related pain. This similarity may be related to local anaesthetic used or the sedation provided before block performance in both groups. Due to the less painful procedure, the patient satisfaction scores were high in both groups.

Abduction of the upper arm at 90° with external rotation of the shoulder decreases the distance between the skin and the brachial plexus, so this position is often preferred to the coracoid approach. Although abduction of the arm reduces the depth of the brachial plexus, it does not change the position of the axillary artery relative to the coracoid process or the pleura.Retro clavicular block is performed without the need for abduction of theupper arm. Adduction of the upper arm is advantageous in patients with limited movement or pain of the arm or shoulder.

The study has the following limitationsAlthough the sample size was sufficient to evaluate needle visibility, it may not have been sufficient to detect rarer effects and complications of the procedure such as vascular puncture, Horner syndrome, pneumothorax, or postoperative neurological deficits. Secondly, the BMIs of the patients in the study were normal. Different results could be obtained with a study sample of obese patients.

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CONCLUSION

The results of this study demonstrated that the retro clavicular approach for Ultrasound guided Infra clavicular brachial plexus block is associated with better needle tip and shaft visibility, shorter performance and anaesthesia-related times and fewer needle passes than the coracoid approach. On the other hand, the retro clavicular approach was like the coracoid approach in terms of success rate and patient comfort.

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PROFORMA

NAME :

I.P.NO :

ASA :

AGE & SEX :

WEIGHT :

DATE&TIME OF ADMISSION:

DATE& TIME OF DISCHARGE:

DIAGNOSIS:

PROCEDURE:

HISTORY:

CLINICAL EXAMINATION: PR, BP, SPO2, RS, CVS, P/A, CNS

BASIC INVESTIGATIONS:

a) Complete Blood Count
b) Blood grouping & typing,
c) BT,CT
d) Urine routine
e) Blood urea, RBS, Serum Creatinine, Serum electrolytes
f) CXR-PA view
g) ECG,ECHO
h) USG abdomen

ANAESTHETIC TECHNIQUE:

Ultrasound guided infraclavicular brachial plexus block –

APPROACH – GROUP C / R -

DOSAGE OF DRUG:25 ml of 0.5 % inj. Bupivacaine

PARAMETERS MONITORED –

1. NEEDLE TIP VISIBILITY – 1 – very poor

   2 – poor
   3 - fair
   4 – good
   5 – very good

2. NEEDLE SHAFT VISIBILITY –

   1 – none of the shaft is visible

   2 - only a small segment is visible

   3–less than half of the shaft is visible

   4 – almost all the shaft is visible

   5 – entire shaft is visible

3. Sensory blockade – 1 – can feel touch not cold

   2 – cannot feel touch and cold

Was evaluated both sensory and motor blockade at the time interval of

5 min	10 min	15 min	20 min	25 min	30 min

4. Motor blockade – 0 – no block

   1- Paresis

   2- Paralysis

5. Number of needle passes (> 2 was considered failure)

6. Block performance time - in minutes

   (time from first insertion of the blocking needle till removal after drug deposition)

7. Onset time –
8. Total anaesthesia related time –

   (sum of block performance and onset time)

9. Block performance related pain – VRS scale

0	1	2	3	4	5	6	7	8	9	10

10. Complications – 1. Paraesthesia

    2. Vascular puncture

    3. Horner syndrome

    4. symptoms of local anaesthetic toxicity

    5. pneumothorax

QUESTIONAIRRES USED IN THE STUDY

1) H/O Any Known allergy to Local Anaesthetics/ any drugs
2) H/O Previous Neurological deficit
3) H/O Any Bleeding diathesis
4) Any infection/Local sepsis at block site
5) H/O Any Anti-Psychiatric drugs
6) H/O Any systemic illness-Hypertension Diabetes Mellitus, Bronchial Asthma, Seizure disorder, Pulmonary Tuberculosis.
7) H/O of smoking ,COPD, Exertional dyspnoea, decreased urine output (Complaints related to CVS, RS, RENAL system)

			MEAN±S.D		NUMBER		MEAN±S.D		mean ± S.D		MEAN±S.D	
	NAME				GENDER		weight		Height		BMI	
SL NO	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C	Group R	Group C	GROUP R	GROUP C
1	AMBIKA	ARADHANA	16	48	F	F	56		1.61	1.46	21.60	25.33
2	RAJU	SELVI	24	58	M	F	60		1.54	1.48	25.30	29.67
3	LOKESH	KARTHI	40	45	M	M	45		1.59	1.64	17.80	24.54
4	ROSY	VALLI	50	32	F	F	44		1.46	1.65	20.64	17.63
5	VELAVAN	JEGAN	46	34	M	M	67		1.5	1.54	29.78	21.08
6	GANESAN	VINAYAK	42	46	M	M	75		1.58	1.48	30.04	30.13
7	BALAJI	BALU	30	57	M	M	65		1.68	1.2	23.03	34.72
8	PARAVATHI	LAKSHMI	55	65	F	F	70		1.7	1.62	24.22	19.05
9	ESWARAN	SANKARAN	46	48	M	M	56		1.6	1.66	21.88	21.77
10	THIRUNAVU	BHARATHI	57	45	M	M	60		1.62	1.56	22.86	22.19
11	KALAI	PARAKAVI	60	65	F	F	67		1.63	1.54	25.22	18.97
12	NALLATHAMBI	ELANGOVAN	40	66	M	M	75		1.2	1.48	52.08	21.00
13	FATHIMA	GOWRI	35	70	F	F	56		1.56	1.59	23.01	19.78
14	FAHAD	ANTONY	24	23	M	M	60		1.48	1.6	27.39	17.58
15	POTHUMPONNU	CHINNAPONNU	23	34	F	F	65		1.51	1.63	28.51	25.22
16	KIRANMAYI	MADHU	20	54	F	F	66		1.57	1.57	26.78	26.78
17	MURALI	RAJA	43	62	M	M	54		1.6	1.56	21.09	26.30
18	ARCHANA	DEEPIKA	65	21	F	F	80		1.62	1.59	30.48	21.36
19	NISHA	ANITHA	45	20	F	F	50		1.2	1.46	34.72	20.64
20	MANI	KAMESH	57	34	M	M	55		1.34	1.45	30.63	20.45
21	YOGESH	BALA	69	38	M	M	54		1.54	1.55	22.77	27.89
22	MOHANA	LAKSHMI	32	26	F	F	60		1.42	1.69	29.76	19.61
23	SELVIN	FLOVYN	21	18	M	M	50		1.54	1.74	21.08	21.47

24	HARISH	ILAM	50	52	M	M	48		1.36	1.7	25.95	17.30
25	JOTHI	KALA	48	50	F	F	60		1.61	1.8	23.15	20.37
26	MUKESH	AMBANI	54	56	M	M	65		1.4	1.6	33.16	25.39
27	SACHIN	SURESH	54	34	M	M	64		1.5	1.5	28.44	28.89
28	RAGUL	LAVANYA	45	36	M	F	56		1.7	1.4	19.38	33.16
29	RAGAVI	BHARGAVI	56	48	F	F	58		1.6	1.6	22.66	26.17
30	INIYAN	KARKI	45	50	M	M	60		1.4	1.4	30.61	33.16
31	INIYAAL	NALLAMUTHU	45	45	F	M	54		1.6	1.8	21.09	20.06
32	VEERAPANDI	ARUMUGAM	40	40	M	M	45		1.4	1.4	22.96	34.18
33	STALIN	DURGA	50	39	M	F	65		1.5	1.7	28.89	31.14
34	LALITHA	SASIKALA	65	40	F	F	59		1.5	1.5	26.22	28.89
35	ALAGIRI	MANIMOZHI	50	39	M	F	70		1.7	1.6	24.22	26.17
36	MUTHU	DAYANIDHI	59	38	M	M	80		1.8	1.6	24.69	23.44
37	KANCHANA	UDAYANIDHI	54	40	F	M	67		1.5	1.7	29.78	29.41
38	EASWARI	EASWARAN	45	45	F	M	75		1.6	1.6	29.30	29.69
39	AMIR	BEGUM	34	50	M	F	80		1.7	1.5	27.68	33.33
40	KAVITHA	SUDARSHAN	65	48	M	F	87		1.7	1.7	30.10	26.99
41	KARPAGAVALLI	VELMURUGAN	54	47	F	M	76		1.5	1.4	33.78	28.06
42	RAJANALINI	GANGA	49	46	F	F	74		1.5	1.5	32.89	28.89
43	SYED	IBRAHIM	25	44	M	M	85		1.8	1.7	26.23	24.22
44	KALYAN	MEGALA	23	50	M	F	87		1.7	1.6	30.10	27.34
45	MAGESHWARI	GANESHPRABHU	29	18	F	M	65		1.4	1.6	33.16	29.30
46	EVYLN	PARVATHY	30	19	F	F	55		1.8	1.8	16.98	20.06
47	PARAMASIVAN	PARTHAVI	31	24	M	F	65		1.6	1.6	25.39	25.39
48	SHANMUGAM	SUNDARAM	35	46	M	M	67		1.5	1.5	29.78	24.00
49	JANAVI	GOPI	34	24	F	M	85		1.6	1.7	33.20	15.57
50	NANDINI	MONICA	30	23	F	F	65		1.5	1.6	28.89	25.39

MEDIAN		MEDIAN		MEAN ±S.D		MEDIAN		NUM %		NUM %	
Needle tip visibility		needle shaft visibility		Block prformance time		num of neele passes		Sensory block		Motor block	
GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C
3	2	4	2	2	6	2	2	1	1	1	1
5	1	5	3	2.5	5	1	2	1	0	1	0
3	2	3	1	4	3.5	1	3	1	1	1	1
3	2	4	4	3.5	4.2	2	3	1	1	1	1
4	3	5	2	1.5	5	2	2	1	1	1	1
4	1	3	3	5	7	1	1	1	1	0	1
4	3	5	3	1.2	6.5	1	2	1	1	1	1
5	3	5	2	2	6	1	3	1	1	1	1
5	3	4	1	1	5.4	1	4	1	1	1	0
3	3	5	4	1.5	4.6	3	4	0	1	0	1
3	3	4	5	6	5	1	2	1	1	1	1
4	4	4	3	1.8	3.5	1	5	1	1	1	1
4	2	3	2	1.6	7	2	1	1	1	1	1
5	2	4	2	3	6	1	2	1	1	1	1
3	2	3	3	3.5	5.8	3	2	1	1	1	1
4	2	4	1	3	4.8	1	3	1	1	1	1
4	3	4	3	2	5	1	3	1	0	1	0
4	3	5	3	2.4	4	1	3	1	1	1	1
5	1	3	2	2.6	6	2	4	1	1	1	1
3	5	4	4	2	8	1	2	1	1	1	1
3	2	4	2	1.5	7.2	2	2	1	1	1	1
4	2	3	2	3	6.4	1	4	1	1	1	1
4	2	5	1	7	7	2	1	1	1	1	1
5	3	3	2	3	5	1	3	1	1	1	1
5	2	4	3	4	5	1	4	1	1	1	1
4	3	3	2	4	6.5	1	3	0	0	0	0
5	3	4	3	3	7	2	2	1	1	1	1
4	2	5	2	2.5	3	1	3	1	1	1	1
3	2	3	3	3	8	1	2	1	1	1	1
4	3	4	2	6	6	1	3	1	0	1	1
3	3	5	4	4	4.5	1	4	1	1	1	1
4	3	4	2	2	6.5	1	3	1	1	1	1
4	3	4	3	1.8	5	2	5	1	1	1	1
4	2	4	2	3	6	2	4	1	1	1	1
3	4	4	3	2	6.7	2	4	1	1	1	1

4	3	4	3	3	7	1	4	1	1	1	1
4	3	5	3	2.5	8	1	5	1	1	1	1
3	3	4	4	2.2	6	2	4	1	1	1	1
3	3	4	3	2.3	6.5	2	3	0	0	1	0
3	3	3	4	2	6	1	3	1	1	1	1
3	4	4	3	2	5	2	4	1	1	1	1
3	2	4	3	3	6	2	4	1	1	1	1
4	2	5	2	3	7	1	5	1	1	0	1
4	3	4	3	4	7	1	4	1	0	1	1
4	3	5	2	2	6.5	2	5	1	1	1	1
3	3	4	3	2.7	6	2	4	1	1	1	1
4	2	4	3	3	6	1	5	1	1	1	0
5	3	4	3	3.6	6	1	4	1	1	1	1
3	3	4	2	2.2	5	1	4	1	1	1	1
4	3	4	3	2.5	6	1	4	1	1	1	1

NUM%		MEAN±S.D		MEAN±S.D		NUM%		NUM%		NUM%	
Surgical success		Onset time		Total anaes tim		Paraesthesia		USE OF analgesic		Supplement LA	
GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C
1	1	15.4	14.5	17	21	0	1	0	0	0	0
1	0	14	15.3	18	19	0	0	0	1	0	1
1	1	12	20	17	18	0	1	0	0	0	0
1	1	16.4	22	19.3	22.4	0	0	0	0	0	0
1	1	14	18	18.8	21	0	0	0	0	0	0
1	1	15	20	18	17	0	0	0	0	0	0
1	1	18	21	17	22.3	0	0	0	0	0	0
1	1	16.5	18.4	19	23	0	0	0	0	0	0
1	1	12.6	22	17.8	20	1	0	0	0	0	0
0	1	21.2	18.4	17.8	20.3	0	0	1	0	1	0
1	1	21	19	19	21	0	0	0	0	0	0
1	1	16.4	16.4	20	21	0	0	0	0	0	0
1	1	17.3	18	17	23	0	0	0	0	0	0
1	1	19	20	18	24	0	1	0	0	0	0
1	1	15.2	19.4	16	25	1	1	0	0	0	0
1	1	16.5	16.6	15	25	0	1	0	0	0	0
1	0	13.2	15.4	16	24.3	0	1	0	1	0	1
1	1	20	18	15.4	24.3	0	0	0	0	0	0
1	1	15.3	20	16.8	25	0	0	0	0	0	0
1	1	16.4	16.4	16.7	21	0	0	0	0	0	0
1	1	21	18.2	16.5	23	0	0	0	0	0	0
1	1	15	19	18	21	0	0	0	0	0	0
1	1	16.4	15	19	23	0	0	0	0	0	0
1	1	20	19	19	24	0	0	0	1	0	1
1	1	15.2	17	18	23	0	0	0	0	0	0
0	0	19	18	19	21	0	0	1	0	1	0
1	1	19	19	18	23	0	0	0	0	0	0
1	1	19.3	20	19	26	0	0	0	0	0	0
1	1	20	21	18	21	0	0	0	0	0	0
1	0	16	18	17.8	21	0	0	0	1	0	1
1	1	20.3	20	17.7	21	0	0	0	0	0	0
1	1	19.8	15	17.6	20	0	0	0	0	0	0
1	1	20	16	16	19	0	0	0	0	0	0
1	1	18	15	17.6	19.4	0	0	0	0	0	0
1	1	19	18	17.4	17.5	0	0	0	0	0	0
1	1	17	19	18	21	0	0	0	0	0	0
1	1	22	18	19	19	0	0	0	0	0	0

1	1	16	19	17.6	19.5	0	0	0	0	0	0
0	0	15	17	18	19.4	0	0	1	1	1	1
1	1	16.7	16	18	19	0	0	0	0	0	0
1	1	20	18	18	20	0	0	0	0	0	0
1	1	16	19	17	21	0	0	0	0	0	0
1	1	19	19	17	22	0	0	0	0	0	0
1	0	15.5	18	18	20	0	0	0	1	0	1
1	1	19	19	17	19.5	0	0	0	0	0	0
1	1	19	19	18.4	20	0	0	0	0	0	0
1	1	20	17.8	18	21	0	0	0	0	0	0
1	1	14.5	18.9	18	21	0	0	0	0	0	0
1	1	19.5	18	18	24	0	0	0	0	0	0
1	1	15.5	17.8	19	21	0	0	0	0	0	0

MEDIAN		MEDIAN		number			
Patient satis		BLOCK RELATED PAIN		VASCULAR PUNCTURE		ASA GRADE	
GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C
4	4	3	2	0	0	1	1
3	3	2	3	0	0	2	1
4	3	3	3	0	0	1	2
5	4	3	2	0	0	1	1
4	3	2	4	0	0	1	1
3	4	2	2	0	0	1	2
4	4	3	2	0	0	2	1
4	4	2	2	0	0	2	2
4	3	3	2	0	0	1	1
3	4	2	2	0	1	2	1
4	4	2	1	0	0	1	2
3	4	2	1	0	0	1	1
3	3	2	2	0	0	2	2
4	3	3	1	0	0	3	1
4	3	2	1	0	0	1	2
4	4	3	2	0	0	3	1
4	4	2	2	0	0	1	2
4	4	3	2	0	0	1	1
4	3	2	3	0	0	1	1
4	5	1	2	0	0	2	1
4	3	3	2	0	0	2	2
4	3	3	2	0	0	3	1
3	3	4	1	0	0	1	1
3	3	4	1	0	0	1	1
3	3	3	3	0	0	1	2
3	3	3	3	0	0	2	1
4	3	4	3	0	0	2	3
3	3	2	3	0	0	2	2
3	3	2	4	0	0	2	2
3	3	3	2	0	0	1	2
5	4	2	4	0	0	1	1
3	4	3	4	0	0	3	2
3	4	3	4	0	0	2	3
3	2	4	3	0	0	1	2
3	3	2	4	0	0	2	2
3	4	3	3	0	0	1	2
3	3	1	4	0	1	2	2
3	4	2	4	0	0	2	1

3	3	2	3	0	0	2	3
3	4	2	3	0	0	1	2
3	3	3	3	0	0	2	1
4	3	2	3	0	0	1	1
4	4	3	3	0	0	1	1
4	4	3	4	0	0	1	1
3	4	3	3	0	0	1	2
3	4	2	3	0	0	2	3
4	3	1	3	0	0	1	1
5	3	2	3	0	0	2	3
3	3	1	2	0	0	1	1
3	3	3	2	0	0	2	1

S.NO		5 MIN		10 MIN		15 MIN		20 MIN		25 MIN		30 MIN
	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C
1	0	0	0	0	0	0	0	0	1	1	1	1
2	0	0	0	0	0	0	0	0	0	1	1	1
3	0	0	1	0	1	0	1	0	1	1	1	1
4	0	0	0	0	0	0	1	1	1	1	1	1
5	0	0	0	0	0	0	1	1	1	1	1	1
6	0	0	1	0	1	0	1	1	1	1	1	1
7	0	0	0	0	0	0	0	0	0	1	0	1
8	0	0	0	0	1	0	1	1	1	1	1	1
9	0	0	0	0	1	1	1	1	1	1	1	1
10	0	0	0	0	0	1	0	1	0	1	1	1
11	0	0	0	0	0	0	0	0	1	0	1	1
12	0	0	0	0	1	1	1	1	1	1	1	1
13	0	0	0	0	0	0	0	1	0	1	0	1
14	0	0	0	0	0	0	0	0	1	0	1	0
15	0	0	0	0	1	0	1	1	1	1	1	1
16	0	0	0	0	0	1	1	1	1	1	1	1
17	0	0	0	0	0	0	0	0	1	1	1	1
18	0	0	0	0	0	0	0	0	0	1	1	1
19	0	0	0	1	0	1	1	0	1	0	1	0
20	0	0	0	1	0	1	1	1	1	1	1	1
21	0	0	0	0	0	0	0	0	1	1	1	1
22	0	0	0	0	0	0	0	1	1	1	1	1
23	0	0	0	0	0	0	0	0	1	0	1	0
24	0	0	0	1	0	1	0	1	1	1	1	1
25	0	0	0	0	0	0	0	0	1	1	1	1
26	0	0	0	0	1	0	1	1	1	1	1	1
27	0	0	0	0	0	0	1	1	1	1	1	1
28	0	0	0	0	0	0	0	0	0	1	0	1
29	0	0	0	0	0	0	0	1	1	0	1	1
30	0	0	0	0	0	0	0	0	1	0	1	0
31	0	0	0	0	0	0	1	1	1	1	1	1
32	0	0	0	0	0	0	0	0	1	0	1	1
33	0	0	0	0	0	0	0	1	0	1	0	1
34	0	0	0	0	0	0	0	1	1	1	1	1
35	0	0	0	0	1	0	1	0	1	1	1	1
36	0	0	0	0	0	0	1	0	1	1	1	1
37	0	0	0	0	0	1	0	1	1	1	1	1
38	0	0	0	0	0	0	0	0	1	1	1	1
39	0	0	0	0	0	0	1	0	1	0	1	0
40	0	0	0	0	0	0	0	1	1	1	1	1

41	0	0	1	0	1	0	1	0	1	0	1	1
42	0	0	0	0	0	0	0	1	1	1	1	1
43	0	0	0	0	0	0	0	0	1	0	1	1
44	0	0	0	0	0	0	1	1	1	1	1	1
45	0	0	0	0	0	1	0	1	1	1	1	1
46	0	0	0	0	0	0	0	0	1	0	1	0
47	0	0	1	0	1	0	1	1	1	1	1	1
48	0	0	0	0	0	0	0	0	1	1	1	1
49	0	0	0	0	0	0	1	1	1	1	1	1
50	0	0	0	0	0	1	0	1	1	1	1	1
MEAN	0	0	0.076923	0.115385	0.269231	0.269231	0.461538	0.538462	0.807692	0.846154	0.923077	0.884615
STD DEV	0	0	0.276887	0.331662	0.43589	0.458258	0.506623	0.509902	0.408248	0.374166	0.276887	0.331662
SUM	0	0	2	3	6	7	11	13	20	21	23	22
P VALUE			0.6411		0.7529		0.5799		0.7194		0.6447	

S.NO		5 MIN		10MIN		15 MIN		20 MIN		25 MIN		30 MIN
	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C	GROUP R	GROUP C
1	0	0	0	0	1	1	1	1	1	1	1	1
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	1	0	1	1	1	1	1	1	1
4	0	0	0	0	0	1	1	1	1	1	1	1
5	0	0	0	0	1	1	1	1	1	1	1	1
6	0	0	0	0	1	1	1	1	1	1	1	1
7	0	0	0	0	0	0	1	1	1	1	1	1
8	0	0	0	1	0	1	1	1	1	1	1	1
9	0	0	0	0	1	0	0	1	1	1	1	1
10	0	0	0	0	1	0	1	0	1	0	1	0
11	0	0	0	0	1	0	1	1	1	1	1	1
12	0	0	0	0	1	0	1	0	1	1	1	1
13	0	0	0	0	1	1	1	1	1	1	1	1
14	0	0	1	0	1	1	1	1	1	1	1	1
15	0	0	0	0	0	1	1	1	1	0	1	1
16	0	0	0	0	0	0	0	0	0	0	1	0
17	0	0	1	0	1	1	1	1	1	1	1	1
18	0	0	0	0	0	1	1	1	1	1	1	1
19	0	0	0	0	0	0	1	1	1	1	1	1
20	0	0	0	0	1	0	1	1	1	1	1	1
21	0	0	0	0	1	0	0	0	1	1	1	1
22	1	0	1	0	1	0	0	0	1	1	1	1
23	0	0	0	0	0	0	0	0	1	1	1	1
24	0	0	0	0	0	0	0	0	1	1	1	1
25	0	0	0	0	0	0	0	0	1	1	1	1
26	0	0	1	1	1	1	1	1	1	1	1	1
27	0	0	0	0	0	0	0	0	1	0	1	1
28	0	0	0	0	1	1	1	1	1	1	1	1
29	0	0	0	0	1	0	1	1	1	1	1	1
30	0	0	0	0	1	0	1	1	1	1	1	1
31	0	0	0	0	0	0	0	0	1	1	1	1
32	0	0	0	0	0	1	1	1	1	1	1	1
33	0	0	0	0	1	0	1	0	1	1	1	1
34	0	0	0	0	1	0	1	1	1	1	1	1
35	1	0	0	0	1	1	1	1	1	1	1	1
36	0	0	0	0	0	1	0	1	0	1	1	1
37	0	0	0	1	1	1	1	1	1	1	1	1
38	0	0	0	0	0	0	0	0	1	0	1	1
39	0	0	0	0	0	0	1	1	1	1	1	1
40	0	0	0	0	0	1	1	1	1	1	1	1
41	0	0	0	0	1	0	1	0	1	0	1	1

42	0	0	0	0	0	0	0	1	0	1	1	1
43	0	0	0	0	0	1	1	1	1	1	1	1
44	0	0	0	0	0	0	1	0	1	1	1	1
45	0	0	0	0	0	0	0	1	1	1	1	1
46	0	0	0	0	1	0	1	0	1	0	1	0
47	0	0	0	0	0	1	0	1	1	1	1	1
48	0	0	0	0	0	0	1	0	1	0	1	0
49	0	0	0	0	0	0	0	1	1	1	1	1
50	0	0	0	0	1	1	1	1	1	1	1	1
MEAN	0.04	0	0.12	0.08	0.52	0.44	0.68	0.64	0.92	0.84	0.96	0.88
STD DEV	0.2	0	0.331662	0.276887	0.509902	0.506623	0.476095	0.489898	0.276887	0.374166	0.2	0.331662
SUM	1	0	3	2	13	11	17	16	23	21	24	22
P VALUE	0.3223		0.6606		0.6229		0.8823		0.3938		0.3051	

MADURAI MEDICAL COLLEGE

MADURAI, TAMILNADU, INDIA -625 020

(Affiliated to The Tamilnadu Dr.MGR Medical University, Chennai, Tamil Nadu)

ETHICS COMMITTEE CERTIFICATE

Name of the Candidate	:	Dr.Dhilipan. S
Course	:	PG in MD., Anaesthesia
Period of Study	:	2016-2019
College	:	MADURAI MEDICAL COLLEGE
Research Topic	:	A study on comparison of the Coracoids and Retroclavicular approaches in ultrasound guided infraclavicular brachial plexus block.
Ethical Committee as on	:	10.07.2018

The Ethics Committee, Madurai Medical College has decided to inform that your Research proposal is accepted.

Member Secretary   Chairman   Dean / Convenor

Prof Dr V Nagaraajan
M.D., MNAMS, D.M., Dsc.,(Neuro), Dsc (Hon)
CHAIRMAN
IEC - Madurai Medical College
Madurai

17 JUL 2018

URKUND

Urkund Analysis Result

Analysed Document:	Comparison of the coracoid and retroclavicular approaches for ultrasound guided infraclavicular brachial plexus block.docx (D42490457)
Submitted:	10/12/2018 5:44:00 PM
Submitted By:	dhilipansankaran0304@gmail.com
Significance:	1 %

Sources included in the report:

ROSEBELL THESIS 13.10.2017 final.docx (D31484383)
https://www.asra.com/pain-resource/article/69/how-i-do-it-infraclavicular-block

Instances where selected sources appear:

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